U.S. DEPARTMENT OF COMMERCE
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PB-264 189

# WASHINGTON COUNTY PROJECT (WORK PLAN)

## DEVELOPMENT AND IMPLEMENTATION OF A SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISM: INSTITUTIONAL ARRANGEMENTS NECESSARY FOR IMPLEMENTATION OF CONTROL METHODOLOGY ON URBAN AND RURAL LANDS

WISCONSIN BOARD OF SOIL AND WATER CONSERVATION DISTRICTS, MADISON

PREPARED FOR
ENVIRONMENTAL PROTECTION AGENCY, CHICAGO, ILLINOIS

JANUARY 1977

PB 264 189

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

EPA-905/9-77-001

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Under U.S. EPA Grant No. G005139

To

## WISCONSIN BOARD OF SOIL AND WATER CONSERVATION DISTRICTS

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## Summary of Planning Phase

Initial contacts regarding the Washington County Project were made in early 1973. For the balance of that year, through a series of meetings between local representatives, state and federal agency personnel, and personnel of the University of Wisconsin, ideas for a project to demonstrate the development of a regulatory mechanism for sediment control in Washington County, Wisconsin, were formulated and later in the year a specific project proposal was developed under the leadership of Dr. T. C. Daniel of the Department of Soil Science of the University of Wisconsin.

The project proposal was submitted to the Environmental Protection Agency on February 28, 1974, and a grant for the development of a project work plan was awarded on May 24, 1974.

Following the award and acceptance of the grant, a small project staff was assembled to coordinate the planning effort. A good deal of time was spent initially in developing the administrative relationships necessary for the proposed interdisciplinary and interagency project. It was agreed that the University of Wisconsin-Extension would serve as the administering agency for the grantee--the State Board of Soil and Water Conservation Districts. Contractual arrangements with cooperating agencies were to be handled by University of Wisconsin-Extension.

Meetings were held with officials of the Village of Germantown to plan for the monitoring of areas being developed to meet growing urban needs. Three sites in the village--one an industrial park and two scheduled for subdivison development--were identified as sites for study of sediment problems arising from urbanization.

To study sediment problems on rural lands, two predominantly agricultural watersheds within the Great Lakes Basin portion of Washington County were suggested to the project staff by the Washington County Board of Soil and Water Conservation District Supervisors. Both watersheds were

reviewed by the project staff. Characteristics such as soils, physiography, potentials for monitoring, and needs for land treatment were carefully analyzed and recommendations submitted to the District Supervisors. Following field hearings and their own review, the supervisors selected the Kewaskum Creek Watershed for study.

Selection of monitoring sites in both the agricultural and urban watersheds was made in concert by representatives of the U.S. Geological Survey, the Wisconsin Department of Natural Resources and the University of Wisconsin. Plans for the installation of land treatment measures in the agricultural watersheds were developed through a contractual arrangement with the U.S. Soil Conservation Service. Land treatment plans for the urbanizing watershed were developed by project staff, representatives of the Village of Germantown and individuals involved in the planned subdivisions.

Critical to the success of the proposed project was putting together a team of social scientists to handle the development of a regulatory mechanism for sediment control. Leading social scientists at the University were contacted and a plan for the project developed. Throughout the project this group will work closely with selected local advisors and with appropriate state, federal and university personnel.

The project staff has, through the planning period, done much of the writing of the work plan although each section of the plan has been widely circulated to appropriate cooperating agencies and individuals for review and comment. This extensive review process has been very time-consuming but it is felt by the project staff that this approach is essential to insure the success of this type of a cooperative, interdisciplinary approach to problem solving.

## A. INTRODUCTION

The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) deal with the protection and improvement of the quality of the nation's lakes and streams. The legislation is specific with respect to the types of pollution to be investigated, the mechanisms and time frame to be used and the agency(ies) having primary responsibility for accomplishing the control aspects of the law. In the past, the US-EPA (see Table 1 for abbreviations used throughout the text) has directed efforts towards the control of point sources of pollution, and guidelines are being developed with respect to the quality of effluent discharge from industry, municipal treatment plants and feedlots. Additionally, the US-EPA is focusing attention on nonpoint or diffuse sources of pollution such as agricultural and urban runoff. Because of their diffuse character, these pollutional sources are more difficult to quantify and define. Undoubtedly, controlling these pollutional sources is complicated by the interrelated complexities and inherent variability in the systems and the inexperience and lack of background information required to cope with the problem. However, control of nonpoint sources is of great importance in maintaining the quality of surface waters, and methods for minimizing their discharge must be developed through strong control measures.

Erosion and subsequent sedimentation are classic examples of pollution arising from a diffuse source. Nationally, sediment is--by volume--the single largest pollutant of the nation's surface waters. Aside from the objection of sediment from an aesthetic standpoint, deposition of sediment in surface waters can cause a degradation in water quality resulting from increases in suspended and bed load sediment, total dissolved solids and oxygen demand. Eutrophying and other components of the eroded material--such as readily available ortho-phosphate, soluble nitrogen and pesticides,

Table 1. Explanation of the abbreviations of agencies and organizations identified in the text

| Abbreviations | Agencies and organizations |
|---|---|
| BSWCD | Board of Soil and Water Conservation Districts |
| NACD | National Association of Conservation Districts |
| SEWRPC | Southeastern Wisconsin Regional Planning Commission |
| USDA-ARS | United States Department of Agriculture - Agricultural Research Service |
| USDA-ASCS | United States Department of Agriculture - Agricultural Stabilization and Conservation Service |
| USDA-SCS | United States Department of Agriculture - Soil Conservation Service |
| US-EPA | United States - Environmental Protection Agency |
| USGS | United States Geological Survey |
| UWEX | University of Wisconsin-Extension |
| UW-MAD | University of Wisconsin-Madison |
| UW-SNR | University of Wisconsin - School of Natural Resources |
| UW-Soil Sci | University of Wisconsin - Department of Soil Science |
| UW-WRC | University of Wisconsin - Water Resources Center |
| WCSWCD | Washington County Soil and Water Conservation District |
| WDA | Wisconsin Department of Agriculture |
| WDNR | Wisconsin Department of Natural Resources |
| WGNHS | Wisconsin Geological and Natural History Survey |

etc.--are also released as a result of interaction between eroded soil particles and surface waters. Annually, dredging costs to keep the nation's streams and harbors open are conservatively estimated at $25 million. Although erosion and sedimentation are natural geological processes which cannot be eliminated completely, man's activities can, and have, greatly accelerated the process. The rates of soil loss are directly related to types of land use. Sediment, with its deleterious effect on water quality, has been identified as the major pollution problem in seven of the seventeen chapters describing the effect of different land use categories identified as potential sources of loading to the Great Lakes by a Reference Group of the U.S.-Canada International Joint Commission (1). This comprehensive review of land use in relation to pollutional loading into the surface waters of the Great Lakes clearly identifies sediment as a major pollutant and calls for new and innovative programs for its control and prevention.

The primary source of sediments polluting surface waters is agricultural and other rural land lacking adequate conservation practices. However, a second major source of sediment is land undergoing changing land use patterns as exemplified by areas of rapid urbanization (construction sites). This source comprises a major hazard because it is largely unabated due to lack of application of conservation practices. Rates of erosion from urbanizing areas may exceed those from agricultural lands by factors from 100:1 to 200:1. Sediment loading into surface waters will increase with time due to the increased demand for agricultural production involving land which formerly had been idle and to continual urbanization and other development of previously rural lands. The land being newly brought into agricultural production is likely to be critical when evaluated in terms of its potential erosional hazard either because of the slope or shallowness of the soil.

Historically, the problem of soil loss has been viewed strictly as a rural problem controlled only for the economic

benefit of the landowners. Presently, and to a greater degree in the future, deterioration in water quality arising from sediment deposition either from rural or urban areas must be viewed in light of the general public's right to and desire for high quality surface water, and included in this evaluation must be the downstream cost and effect of sediment deposition.

Prior investigations and experience by agencies such as the USDA-SCS and USDA-ARS have led to the development of an erosion control technology which, if fully implemented, will dramatically reduce soil loss from unprotected cropland and construction site areas. The major obstacle has been an inability to develop and implement programs which provide a uniformly high degree of land application of conservation practices. Prior experience has shown that the voluntary and incentive mechanisms have been successful to a point; however, these programs do not result in a uniformly high degree of implementation of land practices, especially in the major problem areas. Erosion can be controlled; the problem is development of implementation methodologies to correct the inadequacies of a strictly voluntary-incentive program. Clearly the need exists for developing alternative mechanisms for the implementation of conservation practices, with serious consideration being given to some form or combination of a regulatory approach.

Solving the basic problems of implementation of conservation practices necessitates investigating the social, economic, legal, and political aspects of the issue as well as the technical components. Answers to these questions can only be provided by multi-agency and interdisciplinary programs devoted to problem-oriented research and demonstration. It is only through this mechanism that a forum of exchange between those affected by regulatory programs and the agencies (federal, state, local) required to develop and administer such programs that realistic guidelines and methods of implementation can be developed.

The remaining portion of the report consists of: a. demonstrating that the essential interdisciplinary and interagency program components are incorporated and directed toward solving the basic problem of erosion and sediment control in a results-oriented approach, b. detailing the objectives of the program, and c. describing mechanisms for accomplishing specific objectives.

## B. PROGRAM ORGANIZATION

In order for a project of this size and complexity to function properly, the roles of individuals, committees and agencies involved must be identified and described as clearly as possible. Figure 1 identifies the participants and outlines a structure showing the interrelationships between program components. The roles and responsibilities of agencies in the implementation of the program objectives are shown in Table 2.

The necessity for developing and maintaining local involvement and participation throughout the program is essential. Local participation must involve rural and urban interests, including participation of citizens and the local units of government (county, city and village), in such a manner that input from these diverse interest groups is continually sought and obtained. The WCSWCD supervisors have demonstrated their ability to accept a leadership role in developing local involvement through several meetings involving local citizens, civic organizations, the Washington County Board, and the Germantown Village Board. As a result of these meetings, strong local support and advice have been obtained and have played an important role in the formulation of the major concepts on which this project is based.

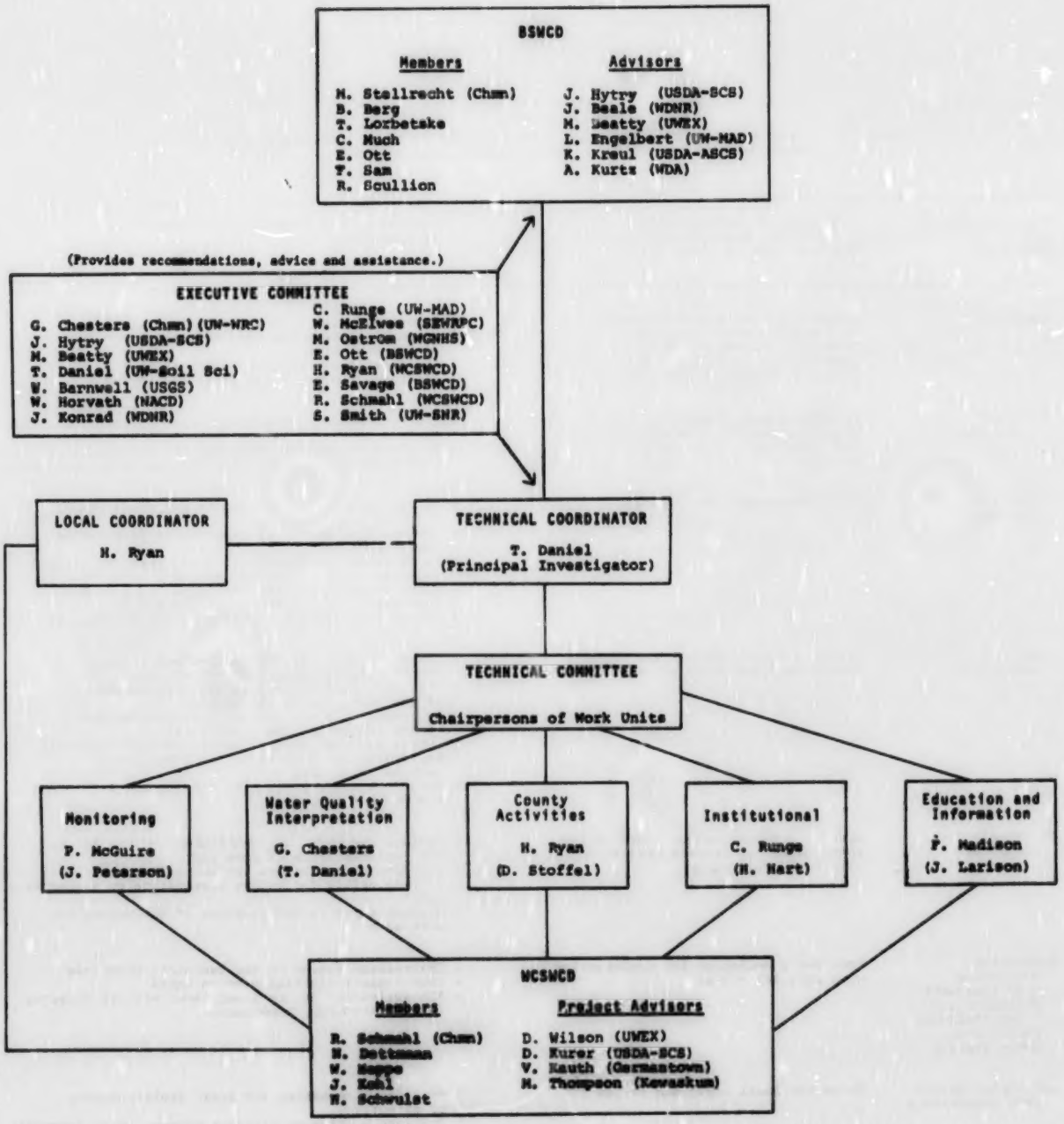



Fig. 1 Program organization

Table 2. Identification of roles and responsibilities of those individuals and organizations identified in the program management outline. (Fig. 1).

| Organization, agency, or individual | Rationale for incorporating or creating those agencies, organizations, or individual | Responsibility toward implementation of objectives |
|---|---|---|
| BSWCD | Lengthy history and involvement in erosion control programs. Primarily responsible for coordinating erosion control programs throughout the state | • Serves as prime contractors with overall responsibilities for implementation of the work plan<br>• Facilitates the implementation of the findings throughout the state and region |
| Executive Committee | Provides forum of exchange between agencies, organizations and individuals affected by program | • Provides recommendations on major policy matters to the prime contractors (State Board)<br>• Provides advice and assistance to the Technical Coordinator in facilitating the day to day operation |
| Technical Coordinator | Provides overall coordination | • Is responsible for the day to day operation of the work plan<br>• Assists the Executive Committee in formulating recommendations<br>• Facilitates information flow and acts in a liaison capacity between project personnel<br>• Works closely with the Washington County SWCD Supervisor through the Local Coordinator<br>• Serves as chairperson to the Technical Committee |
| Local Coordinator | Provides local identity and input toward implementation of objectives | • Maintains local support of project through the Washington County SWCD Supervisors<br>• Provides local input into the implementation of the work plan at all levels<br>• Is responsible for the day to day operations of the project at the local level<br>• Serves as local contact person through which all aspects of the project at the local level must be channelled<br>• Acts in a liaison capacity between local interest and project personnel |
| Technical Committee | Assures a mechanism for facilitating coordination of efforts between the five basic work units | • Assists the Technical Coordinator in the day to day implementation of work plan<br>• Coordinates activities between units<br>• Is responsible for report preparation on a quarterly basis<br>• Members serve as chairpersons of the respective work units |
| Work units:<br>Monitoring<br>Land treatment<br>Ordinance and institutional<br>Educational<br>Water quality | Provides a mechanism for implementing work unit activities | • Chairperson serves on the Technical Committee<br>• Coordinate activities between units<br>• All activities at the local level will be directed through the Local Coordinator |
| Washington County SWCD Supervisors | Forum for local input and review | • Provides a mechanism for local implementation of objectives<br>• Provides a forum of exchange between local interest and project participants<br>• Maintains local support of the project<br>• Review and revise the ordinance at the local level<br>• Assists Local Coordinator in developing and maintaining local identity for the project |

## C. OBJECTIVES

As a result of input from the participants identified in Figure 1, the overall objectives of the program are to demonstrate the effectiveness of land treatment measures in improving water quality and to devise the necessary institutional arrangements required for the preparation, acceptance and implementation of a sediment control ordinance or other regulatory program applicable to incorporated and unincorporated areas on a county-wide basis. Specific objectives deemed necessary for the successful attainment of the overall objectives are:

1. Demonstrate through a monitoring program the effectiveness of sediment and erosion control techniques for improving water quality.
2. Develop a sediment control ordinance or other regulatory mechanism acceptable to landowners and the several governmental authorities responsible for implementing such measures and determine the combination(s) of institutional arrangements in the form of laws and intergovernmental relationships involving federal, state, county, and municipal governments required for implementing regulatory programs in incorporated and unincorporated areas on a county-wide basis.
3. Develop a model of the personnel required and the technical and financial assistance needed to implement a sediment control program using a regulatory approach.
4. Develop and systemize the educational and information dissemination effort to the appropriate user groups required for implementing a sediment control program using a regulatory approach.
5. Provide an evaluation of the feasibility of implementing regulatory sediment and erosion control programs in the Great Lakes Basin States and other areas where applicable.

## D. WASHINGTON COUNTY WORK PLAN

This section of the work plan will provide detailed procedures for accomplishing the stated objectives. Each objective is addressed separately and appears in numerical sequence identified in Section C (page 9).

### 1. DEMONSTRATING IMPROVEMENTS IN WATER QUALITY

In order to accomplish this objective it was deemed necessary to select land areas to be investigated, determine the land treatments to be employed and establish a water quality monitoring and analytical program. Each factor is closely related and must be evaluated in terms of potential for demonstrating changes in water quality as a result of implementation of conservation techniques. This concept has been incorporated into the remainder of this section, appearing as follows: a. watershed selection, b. location of monitoring sites, c. land treatment, d. installation of monitoring equipment, e. sampling program, f. parameters to be measured, g. methods of analysis, and h. data analysis, storage and retrieval.

#### Watershed Selection

Two watersheds in the Great Lakes Drainage Basin (hereinafter "Basin") portion of Washington County were selected as being representative of an agricultural and rapidly urbanizing area. Watershed selection commensurate with the first objective necessitates an evaluation in the framework of the following criteria:

- Watersheds must be confined to the Basin
- The agricultural watershed should reflect the predominant types of agrarian enterprise found in the Basin.

- The urbanizing watershed must include a high density developing area within the corporate boundary of a village or city.
- Both watersheds must contain a high potential for demonstrating improvements in water quality as a result of implementing erosion control techniques. Factors determining this feature include the following:
  - Existing problems of soil erosion or other sources of water pollution attributable to topography, soil type or present and proposed land use activities.
  - Inherent water quality monitoring capabilities as determined by stream characteristics in relation to land treatment needs and application feasibility.
- Public support for the program must be demonstrable in the selected watersheds.

The distribution of agricultural land with respect to type of enterprise in the Basin (U.S. only) is shown in Table 3. Dairy farms and other livestock operations account for 54.2%, grain and row crops 36.6%, and truck farming 9.0% of the agricultural land use in the Basin (2).

Alternative watersheds which met the first four criteria were selected from that portion of Washington County which lies in the Basin (Fig. 2). Information upon which to base selection decision was developed by utilizing: a. population forecasts, b. on site investigations, c. base maps depicting watershed boundaries, soil properties, stream characteristics, topography, and prime agricultural land, and d. present and proposed high density construction activity (3). Review and evaluation of alternative watersheds with respect to the last criterion by the WCSWCD Supervisors and the Village Board of Germantown resulted in the selection of two watersheds which satisfy all criteria. Study sites selected are the Germantown and the Kewaskum Watersheds, representative of urbanizing and agricultural watersheds respectively (Fig. 2). The remainder of this section is directed toward providing

Table 3. Distribution of the agricultural land in the Great Lakes Drainage Basin (U.S.) according to various agricultural enterprise systems[a]

| Enterprise[b] | Acres[c] x $10^3$ | | Agricultural land attributed to specific crops and enterprise systems, % | |
|---|---|---|---|---|
| **Dairying & livestock** | | | | |
| Oats | 1,695 | | 7.0 | |
| Misc. small grains | 42 | | .2 | |
| Corn silage | 1,220 | | 5.0 | |
| Alfalfa hay | 3,699 | | 15.3 | |
| Cl-tim-other-hay | 1,921 | | 7.9 | |
| Cropland pasture | 1,041 | | 4.3 | |
| Pasture | 3,505 | | 14.5 | |
| | | 13,127 | | 54.2 |
| **Grain or row crop** | | | | |
| Wheat | 1,756 | | 7.3 | |
| Rye | 59 | | .2 | |
| Barley | 44 | | .2 | |
| Corn | 4,369 | | 18.1 | |
| Soybeans | 2,604 | | 10.8 | |
| | | 8,834 | | 36.6 |
| **Truck farming** | | | | |
| Sugar beets | 128 | | 0.5 | |
| Potatoes | 151 | | 0.6 | |
| Fruit | 600 | | 2.5 | |
| Common vegetables | 520 | | 2.1 | |
| Commercial sod | 52 | | 0.2 | |
| Dry edible beans | 755 | | 3.1 | |
| | | 1,688 | | 9.0 |

[a]From the Great Lakes Basin Framework Study. 1971. Land Use and Management. Great Lakes Basin Commission, Ann Arbor, Mich., Appendix 13, pp. 13-91.
[b]Allocation of individual crops within specific enterprise systems was accomplished on the basis of the particular crop being more related to that specific enterprise.
[c]Land use within the United States only.

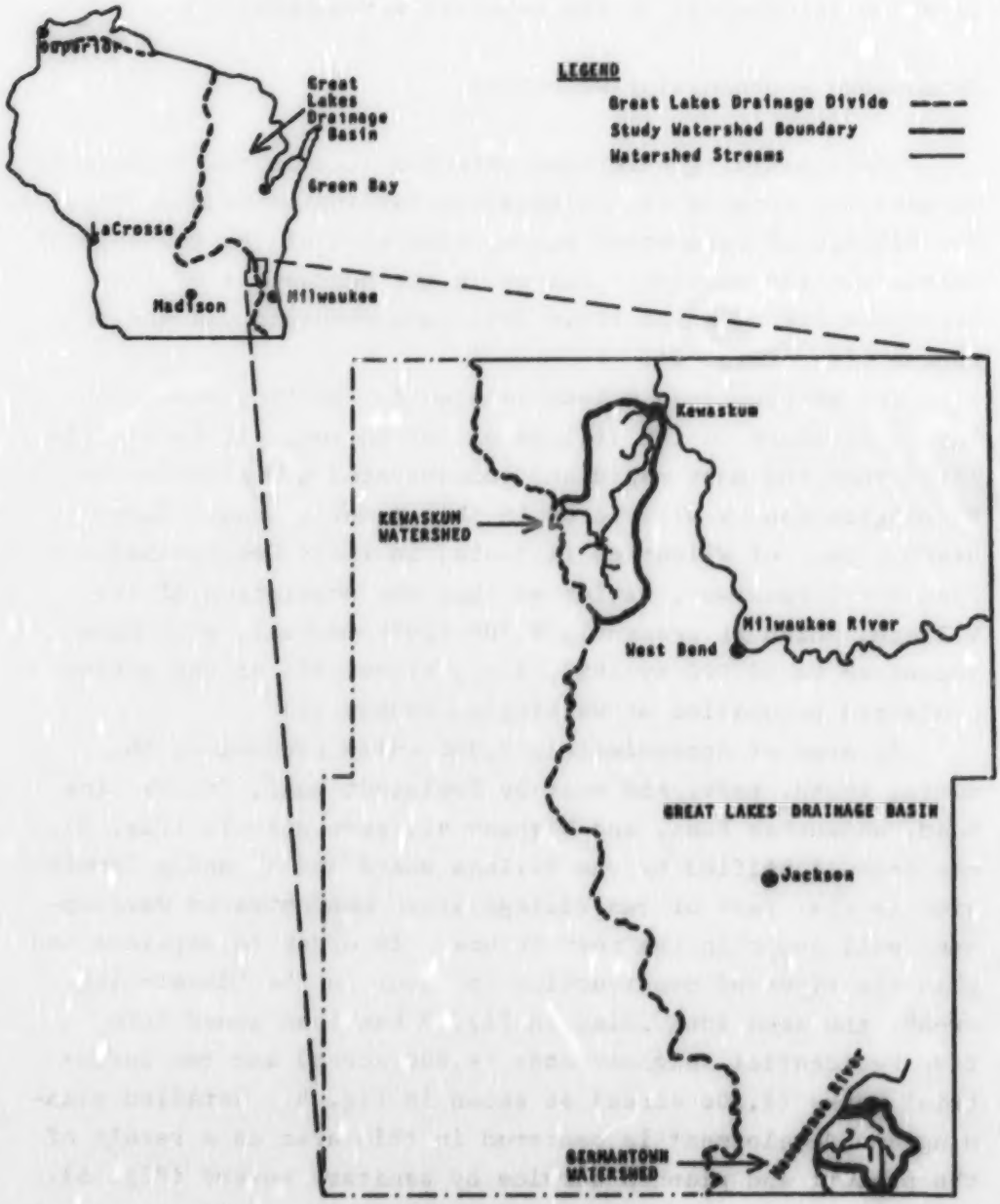



FIG. 2 Map of Washington County, Wisconsin, showing its geographical location and selected project sites in the Great Lakes Drainage Basin.

detailed information on the selected watersheds.

Germantown - urbanizing watershed

The urbanizing watershed selected lies in the Village of Germantown, located in southeastern Washington County (Fig. 2). The Village of Germantown encompasses most of the township of Germantown (36 sections) and is in the headwaters of the Menomonee River, which flows into Lake Michigan via the Milwaukee River (Fig. 3).

The metropolitan Milwaukee area is exerting heavy population pressure on the Village of Germantown. It is anticipated that the most rapid and concentrated urbanization in Washington County will occur in this general area. Tech-Search, Inc. of Wilmette, Illinois, in their Comprehensive Plan for Germantown, estimated that the population of the Village, which is presently 8,200 (1974 Census), will have increased to 30,700 by 1990, i.e., almost 35% of the entire projected population of Washington County (4).

An area of approximately 7,000 acres bounded on the north, south, east, and west by Freistadt Road, County Line Road, Wausaukee Road, and Highway 41, respectively (Fig. 3), has been identified by the Village Board and Planning Commission as that part of the Village where concentrated development will occur in the near future. In order to regulate and plan the types of construction to occur in the "developing area", the area identified in Fig. 3 has been zoned into five residential neighborhoods (4,800 acres) and two industrial parks (2,200 acres) as shown in Fig. 4. Detailed planning and development is centered in this area as a result of the present and planned service by sanitary sewers (Fig. 5). Little construction activity is anticipated outside the developing area, other than low density and random development.

Specific delineation of a watershed in the developing area necessitates identifying the time sequence of construction activity and interpreting this information with respect to watershed boundaries and stream monitoring capabilities.

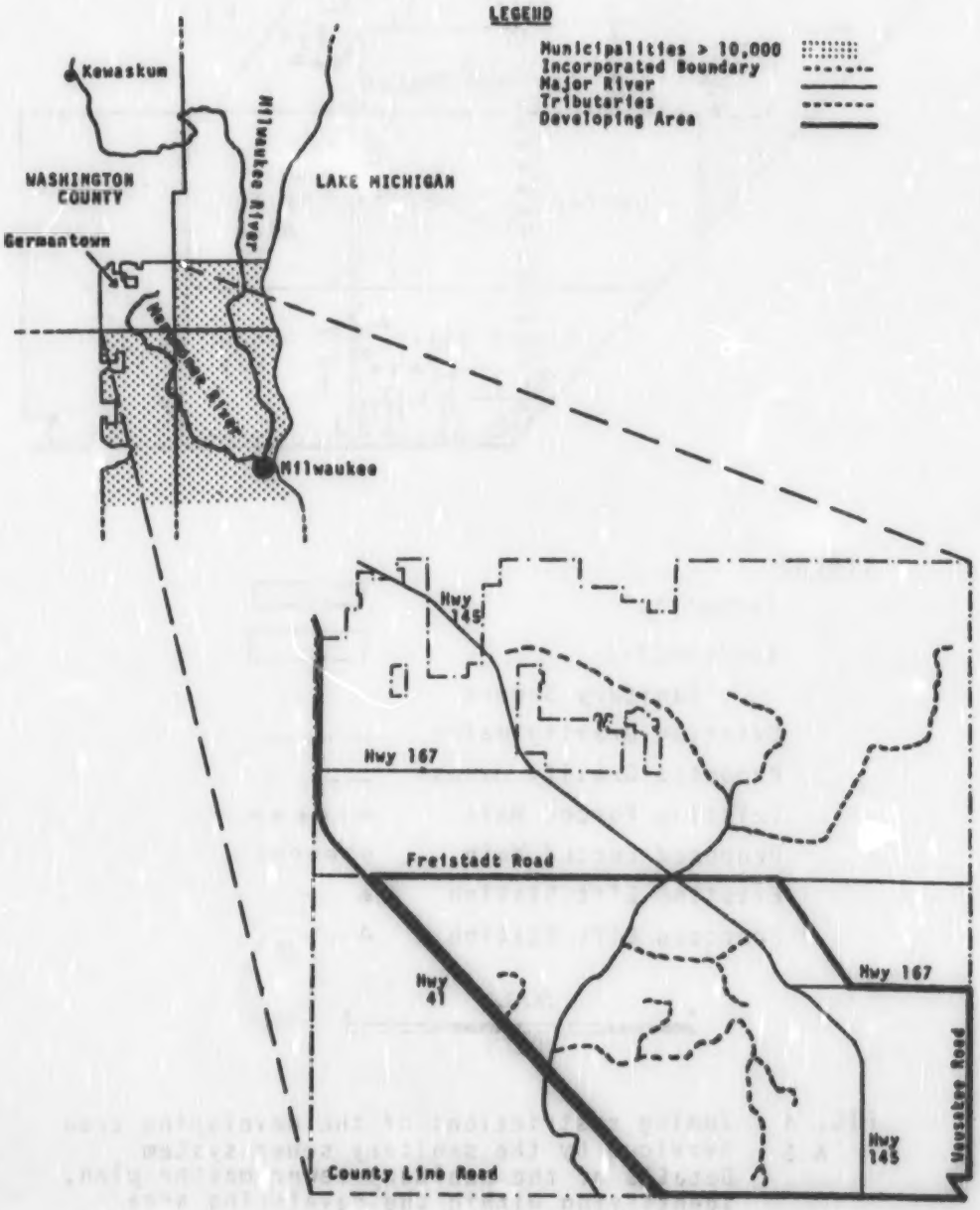
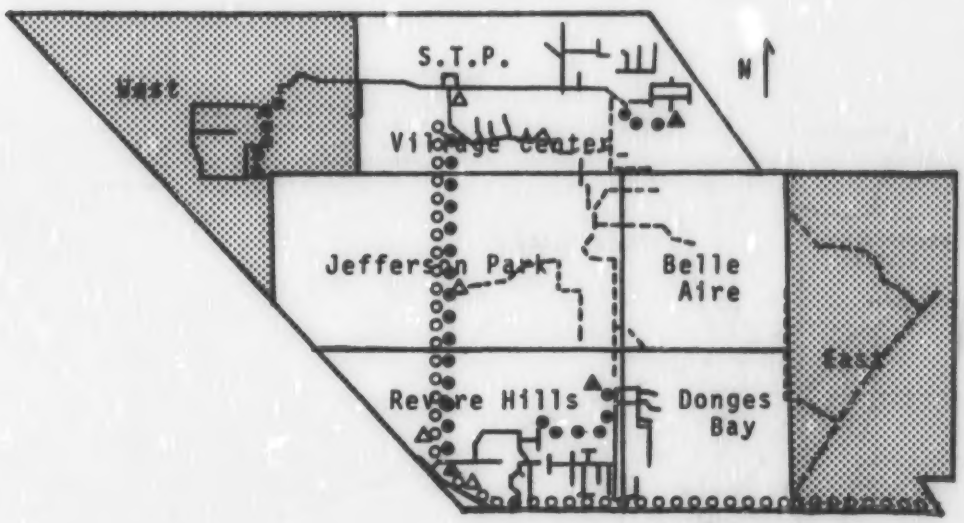



FIG. 3. Details of the Village of Germantown showing: 1. proximity to large metropolitan areas and major rivers draining into Lake Michigan, 2. region in village identified as developing area.




LEGEND

| | |
|---|---|
| Industrial | |
| Residential | |
| Sanitary Sewers | |
| Existing Gravity Mains | ——— |
| Proposed Gravity Mains | - - - - - - - |
| Existing Forced Main | ●●●●●● |
| Proposed Forced Main | oooooo |
| Existing Lift Station | ▲ |
| Proposed Lift Station | △ |

SCALE

MILES

FIG. 4 & 5 Zoning restrictions of the developing area serviced by the sanitary sewer system. Details of the sanitary sewer master plan, identifying within the developing area the locations most likely to undergo high density development as a result of sanitary sewer services being provided.

Future construction activity (Summer of 1975) is concentrated in the areas identified in Fig. 6. Approximately 200 acres of land in the area zoned as residential are scheduled for development during 1975 and 1976. Three areas, totalling approximately 120 acres, have preliminary plans that have been submitted to the Village for approval. Construction activity in the Industrial Park-West is presently taking place, with continued activity expected during the summer of 1975. It is anticipated that construction activity will be initially confined to the area identified in Fig. 6. with expansion occurring in the remaining portion of the developing area at a later date, but within the time frame of the project.

Intermittent tributaries of the Menomonee River are located throughout the developing area (Fig. 8). The residential area undergoing the most rapid development in the near future is drained north by predominantly one intermittent stream which originates near County Line Road and discharges into the Menomonee River near Highway 41. Drainage from the Industrial Park-West is predominantly restricted to one stream which intersects Mequon Road, drains south and flows into the Menomonee River through a drainage ditch along Highway 41. Monitoring of these intermittent streams, geographically located in close proximity to high density construction activity, will provide background information concerning water quality and erosion rates from urbanizing areas. The watershed boundaries encompassing these streams and future construction activity were delineated from 2-foot vertical interval contour maps (Fig. 7).

Kewaskum Creek - agricultural watershed

The agricultural watershed selected is located southwest of the town of Kewaskum (Fig. 2) and covers areas in the Townships of Kewaskum, Wayne and Barton. North and south accesses through the area are by County Roads B, D, and BD, respectfully (Fig. 8). The Kewaskum Creek is the major

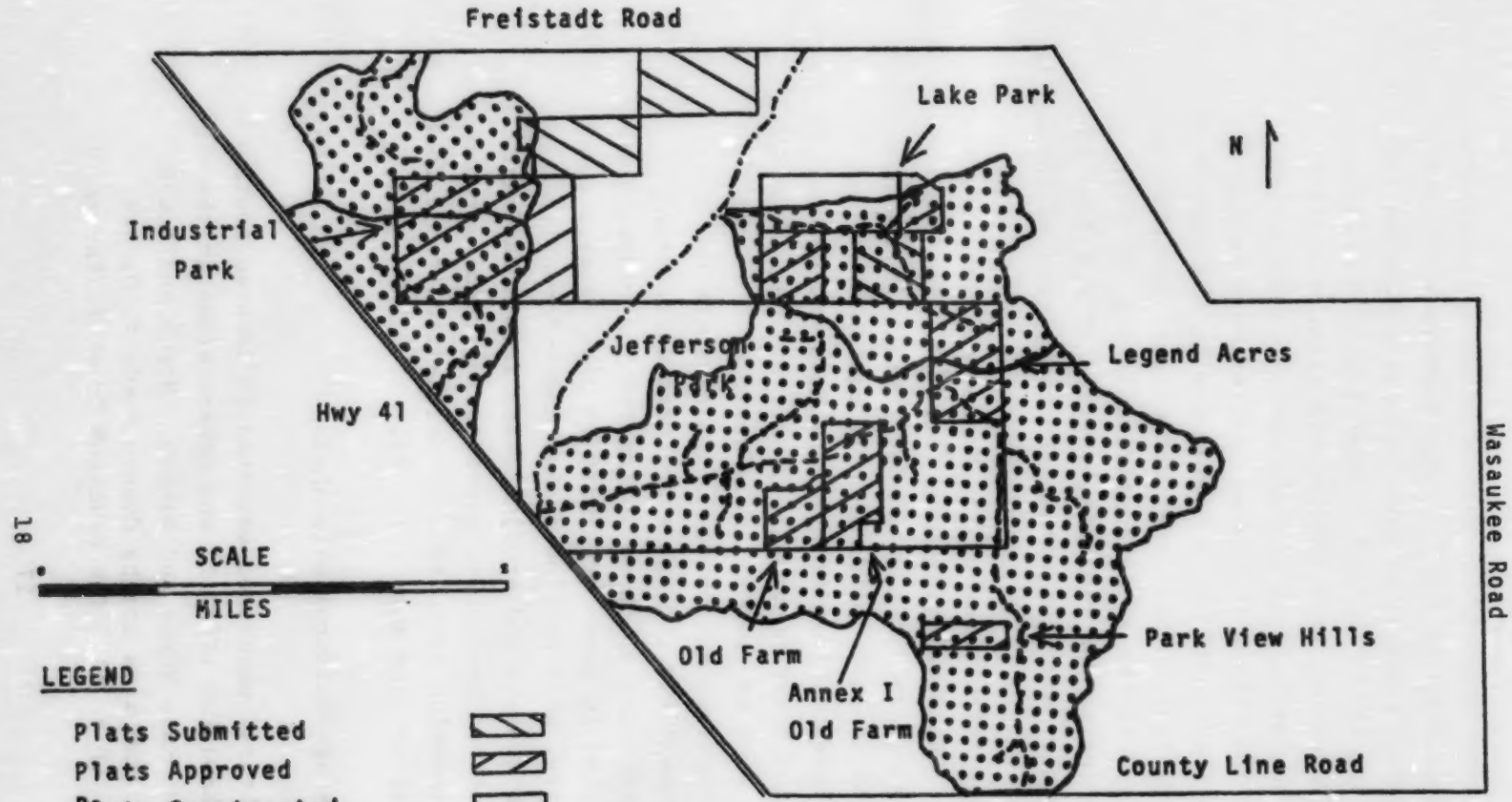



FIG. 6 & 7 Details of developing area, specifically identifying Jefferson Park; sites where plats have been approved for construction and proposed sites for future development. Included is delineation of the urbanizing watershed.

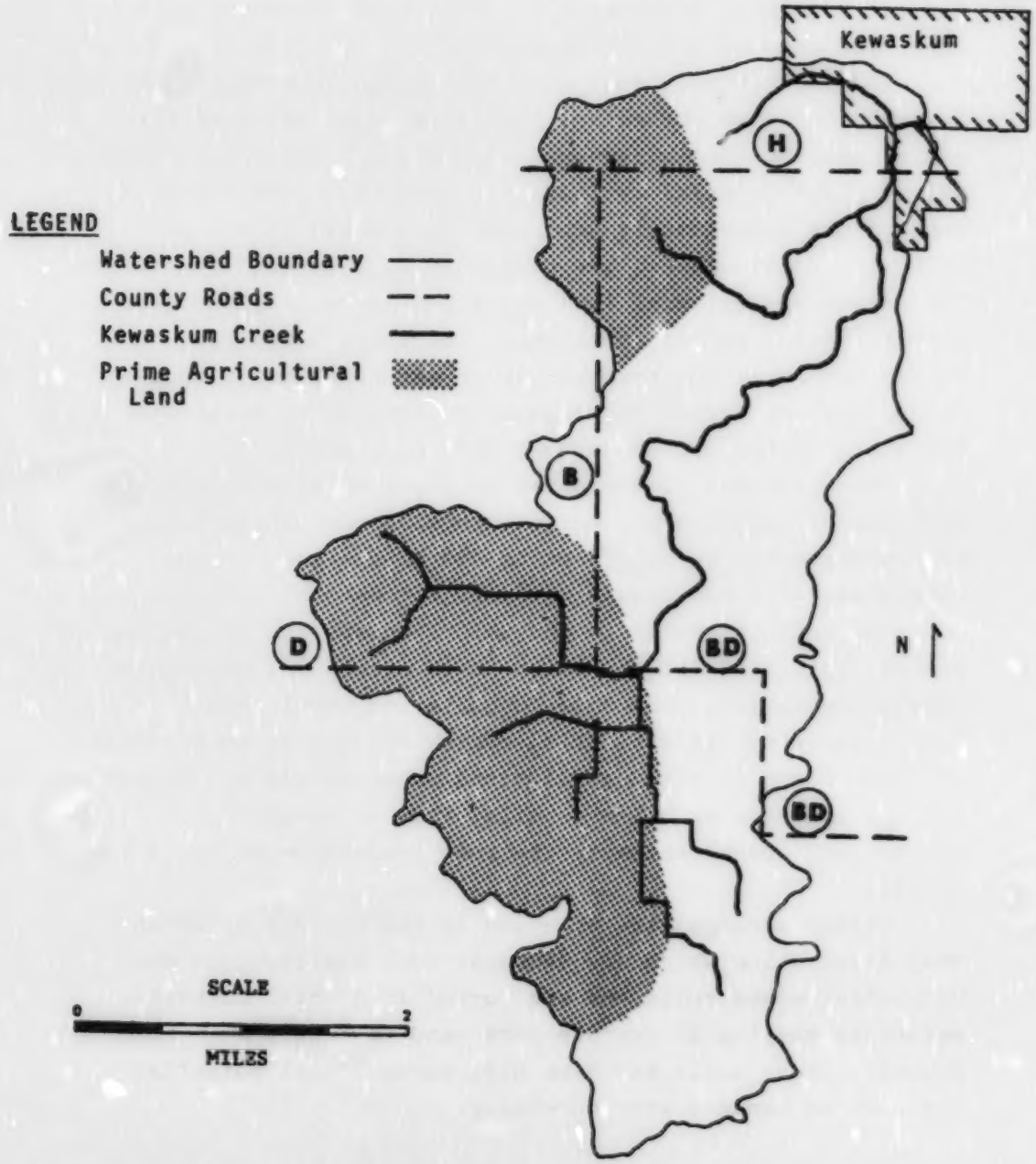



FIG. 8 Kewaskum Watershed depicting prime agricultural land, tributaries of Kewaskum Creek and proximity to the Village of Kewaskum.

natural waterway, flowing north through Kewaskum and into Lake Michigan via the Milwaukee River.

The soils, topography and type of agriculture in the Kewaskum Creek watershed are fairly representative of the entire county. The watershed encompasses 7,936 acres, about 40% of which is prime agricultural land (5). The northern part of the watershed is dominated by a broad floodplain, which is poorly drained and overgrown with natural vegetation. The active agricultural land has a gently-rolling topography with potential erosion problems. The steep slope/flat valley nature of the Kewaskum Creek watershed has produced a landscape of agricultural land interrupted by areas either too steep or too wet to support this enterprise.

The watershed is dominated by dairy farming with lesser acreages of cash crops. Adequate soil conservation measures are estimated to be in effect on 60% of the land in the watershed, with 40% requiring further treatment.

The dominant soils in the watershed are the Hochheim-Theresa Soil Association, which cover nearly 50% of Washington County (6). The Soil Conservation Service in its land capability classification system designates these soils as Class I and II with only limited restrictions due to water and erosion hazards. These soils, from an agricultural standpoint, are potentially the most productive soils in the county.

Lesser acreages are occupied by the Casco-Fox-Rodman Soil Association which are somewhat more shallow than the Hochheim-Theresa soils and are formed in glacial outwash--materials varying in texture from sand to fairly coarse gravel. These soils may have high agricultural potential but must be managed very carefully.

## Location of Monitoring Sites

### Germantown watershed

Within the Germantown Watershed the areas which will be undergoing development in the near future are the

residential Jefferson Park Neighborhood and the Industrial Park-West (Fig. 9).

In Jefferson Park, two areas are scheduled for development during the first year of the project, namely, Old Farm, about 45 acres, and Legend Acres, about 80 acres (Fig. 10). To demonstrate changes in sediment load and water quality due to the application of conservation measures in an urbanizing area, surface water will be monitored at five sites in Jefferson Park. The location of these sites is shown in Fig. 10.

Station G1 will be located on the main drainage channel through Jefferson Park, just after it passes under South Division Road. This station will monitor runoff from approximately 75% of that portion of the Germantown Watershed that will eventually undergo residential development. The station will be constructed, instrumented and maintained by USGS under a subcontractual agreement.

In the urbanizing area where changes are being made in the physical characteristics of the landscape and in the type of land use, monitoring water quality before and after the implementation of conservation measures would not yield the desired information. Therefore, it will be necessary to monitor similar developing areas, simultaneously, with some areas receiving high intensity conservation practices (treatment) and other areas undergoing normal construction activity (nontreatment).

Monitoring stations G2 and G3 will be located at the outfalls of the two enclosed storm drains which will emanate from the Old Farm subdivision (Fig. 10). Soil conservation and sediment control practices will be implemented on the area monitored by station G3, while the area monitored by G2 will not be treated. Stations G4 and G5 will be located on enclosed storm sewer and surface drains, respectively, which receive runoff from the southern and northern halves of Legend Acres. Soil conservation and sediment control practices will be implemented only on the southern portion of Legend Acres.

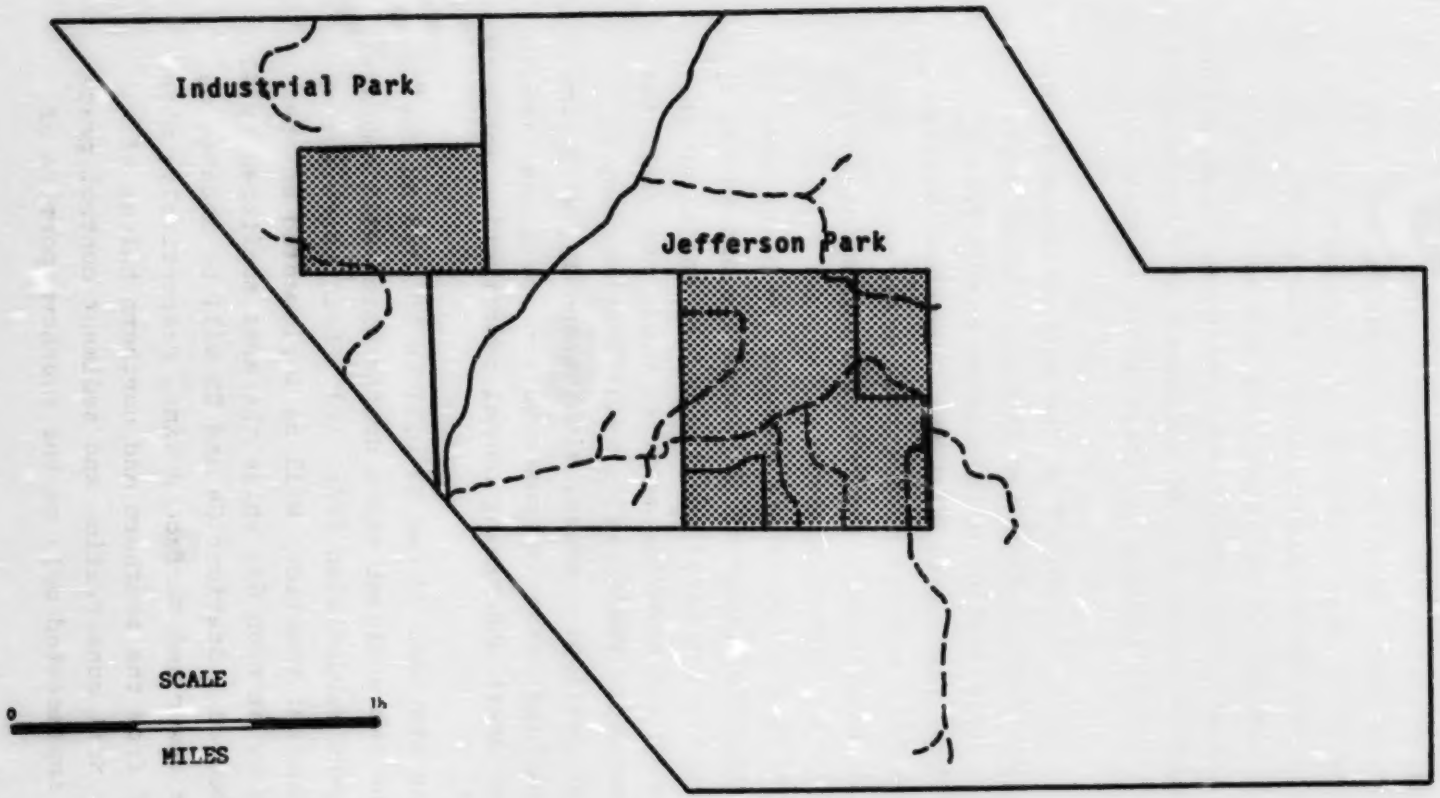



FIG. 9 Portions of Jefferson Park and Industrial Park West (shaded) scheduled for immediate development.

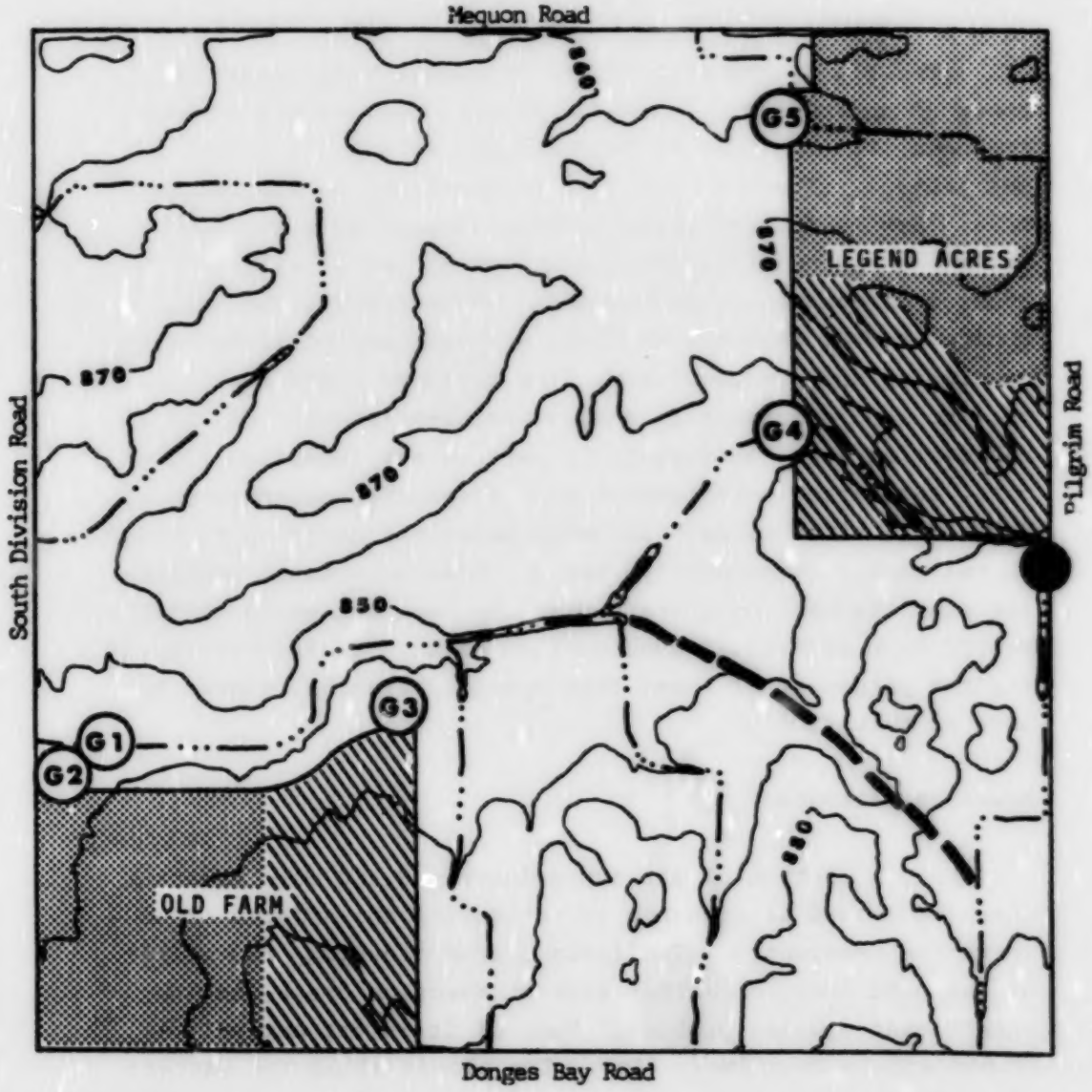


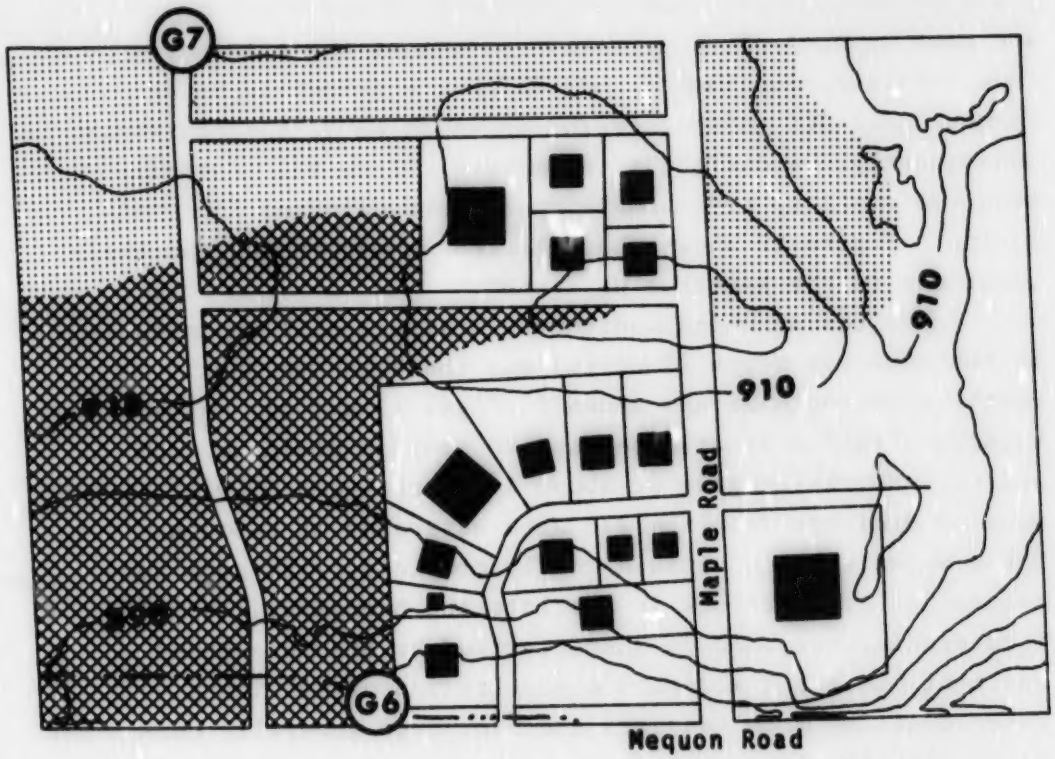

FIG. 10 Developing portion of Jefferson Park showing monitoring sites in relation to treated and nontreated areas within Legend Acres and Old Farm.

The area to the west of the Menomonee River that is zoned as an industrial park is presently undergoing development and will continue to be developed during the course of the project. The area still to be developed in the Industrial Park is divided approximately in half by a surface watershed divide (Fig. 11). Stations G6 and G7 will be located on open and closed drains, respectively, and will monitor runoff from the southern and northern portions of the developing area respectively. The southern portion will receive land treatment to reduce sediment losses. Unlike a residential area, an industrial park is not developed all at once, but rather construction activities are concentrated at individual sites as each industry makes the decision to build in the park. Consequently, two or three additional monitoring stations will be installed as the need arises to collect runoff from individual construction sites. Decisions regarding the placement of these site specific stations cannot be made at this time.

Kewaskum watershed

Only a portion of the approximately 8,000 acre Kewaskum Creek Watershed is amenable to monitoring the effects of conservation treatments. The lowland area occupying the center of the watershed, on either side of Kewaskum Creek, has no significant erosion problem. Much of it is not actively farmed and is relatively flat. The slopes along the eastern edge of the watershed and in the southern tip are steep enough to have severe erosion problems, but surface runoff from these areas is quite diffuse and, consequently, does not lend itself to monitoring.

The uplands west of Kewaskum Creek offer the best possibilities for demonstrating improvements in water quality resulting from implementation of conservation techniques. This area is actively farmed and includes row crops, small grains, hay, and livestock operations. The slopes are steep enough to constitute an erosion hazard, and waterways are




**LEGEND**

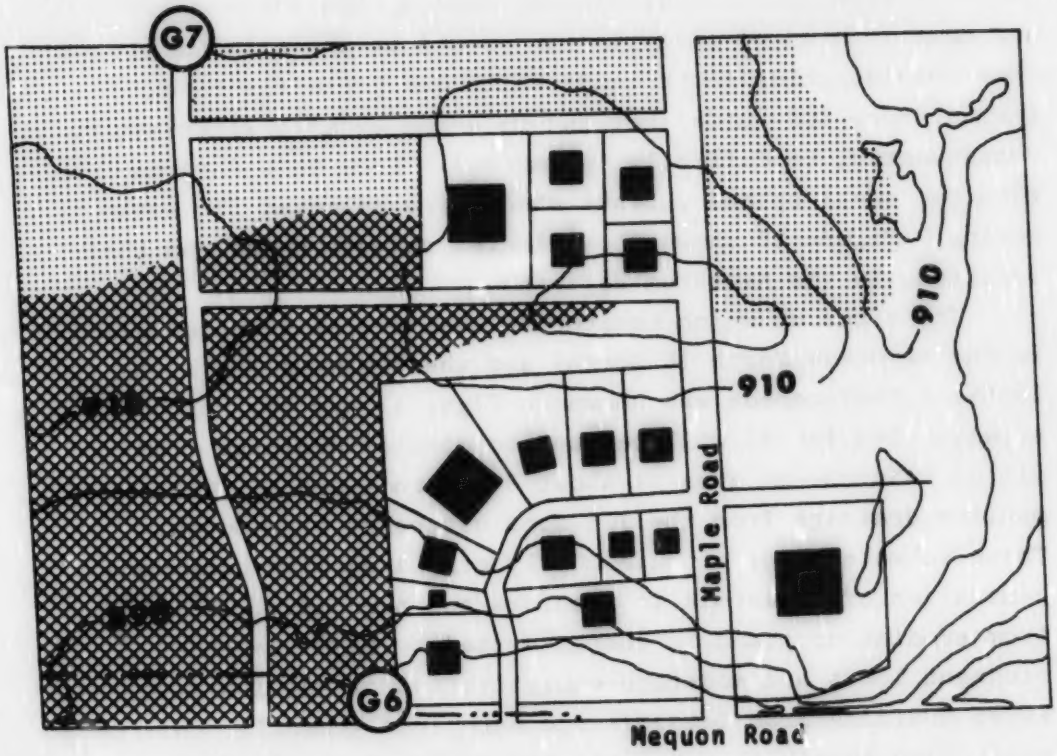
- Monitoring Site
- To Be Developed With Treatment
- To Be Developed Without Treatment
- Developed Lot

SCALE

0 ¼ ½

MILES

FIG. 11 Developing portion of Industrial Park West showing treated and nontreated areas to be monitored.




**LEGEND**

Monitoring Site

To Be Developed With Treatment

To Be Developed Without Treatment

Developed Lot

SCALE

0 ½ 1

MILES

FIG. 11 Developing portion of Industrial Park West showing treated and nontreated areas to be monitored.

sufficiently well-defined to allow monitoring. An SCS Conservation Needs Inventory accomplished during the planning phase of this project identified those upland areas which are most in need of conservation practices and eliminated from consideration those lands which are presently being farmed under SCS guidelines and on which water quality would, consequently, be difficult to improve. From this information two small upland subwatersheds were selected for monitoring. Figure 12 shows the selected subwatersheds and their locations in the Kewaskum Watershed.

The sites at which monitoring stations will be installed in the Kewaskum North (K-North) and the Kewaskum South (K-South) subwatersheds are shown in Figs. 13 and 14, respectively. Station K1 will be used to monitor drainage from all of K-North--an area of about 340 acres--and K6 will monitor drainage from the 275 acre watershed of K-South. These subwatersheds contain mostly cropland, with some concentration of livestock in feedlots and barnyards. Runoff from eroding cropland is characterized by high suspended sediment loads and moderate concentration of nutrients. Water draining from feedlots and barnyards generally contains high levels of nutrients and oxygen demanding materials. The sediment load from livestock areas can be quite variable. The water quality data collected at sites K1 and K6 will represent the composite effects of these land uses.

In order to separate the water quality effects of cropland and livestock operations, several additional stations will be specifically located on drainage ways emanating from lands having a predominant single use. Station K2 will be located in a gully draining through cattle and hog feedlots. Station K3 will monitor runoff from about 165 acres of cropland with no concentration of livestock. Station K4 will be installed directly below a large barnyard area. While this area does not actually lie in the K-North subwatershed, it will be a worthwhile site to monitor because it has both an animal waste problem and an erosion problem due to the animals being confined on a steep, bare slope. Station K5 will be situated on a gully in the

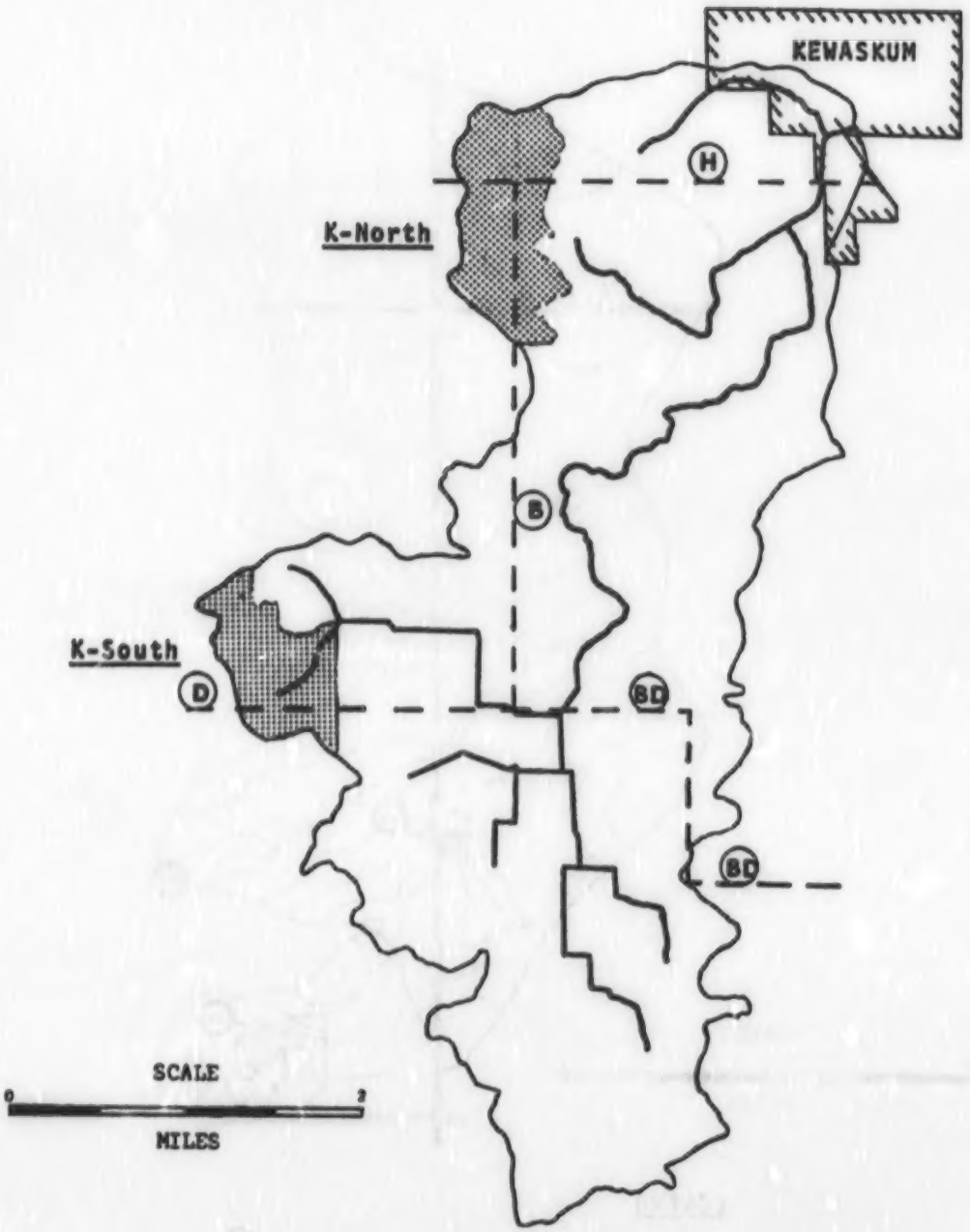
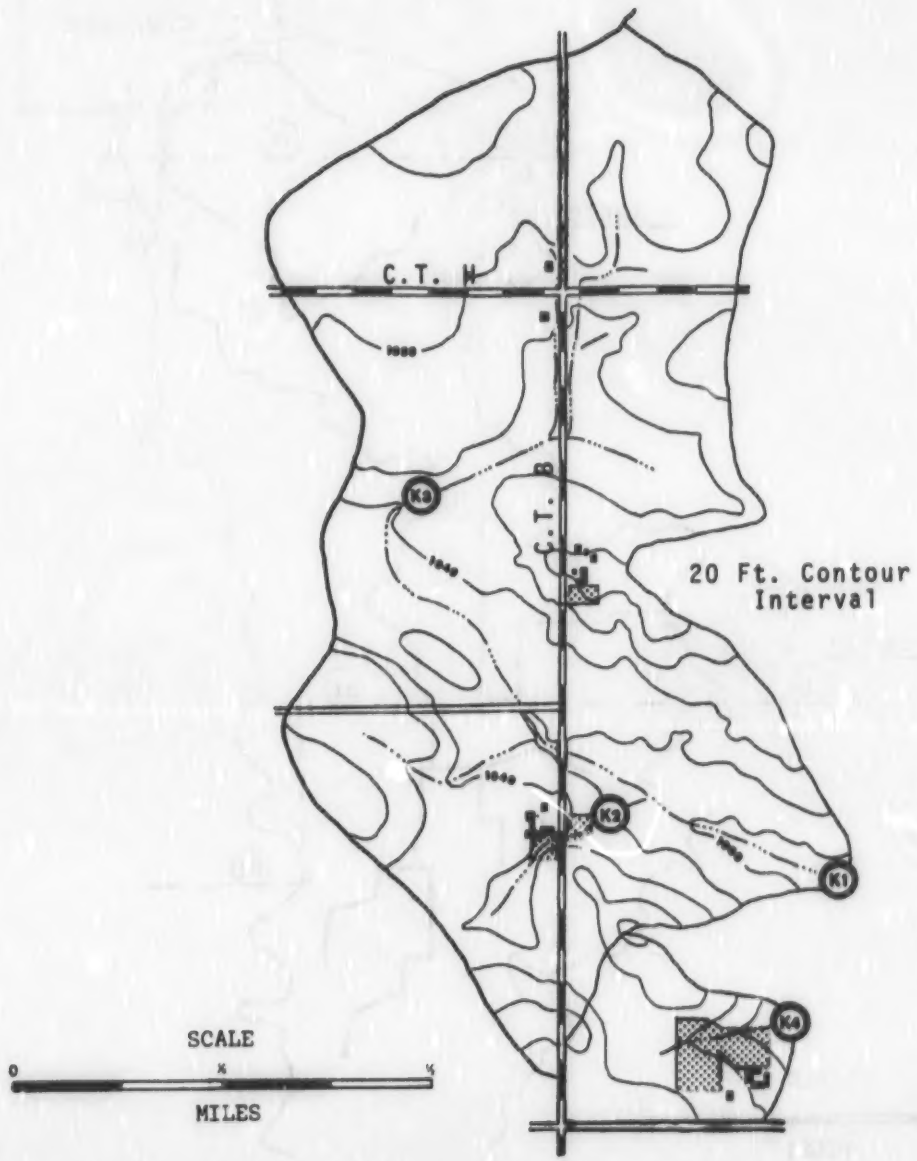



FIG. 12 Kewaskum Watershed showing location (shaded) of K-North and K-South Subwatersheds.




LEGEND

Monitoring Site
Livestock Concentration
Contributing Areas
Intermittent Streams
County Highways

FIG. 13 Kewaskum Subwatershed (K-North) showing location of monitoring sites.

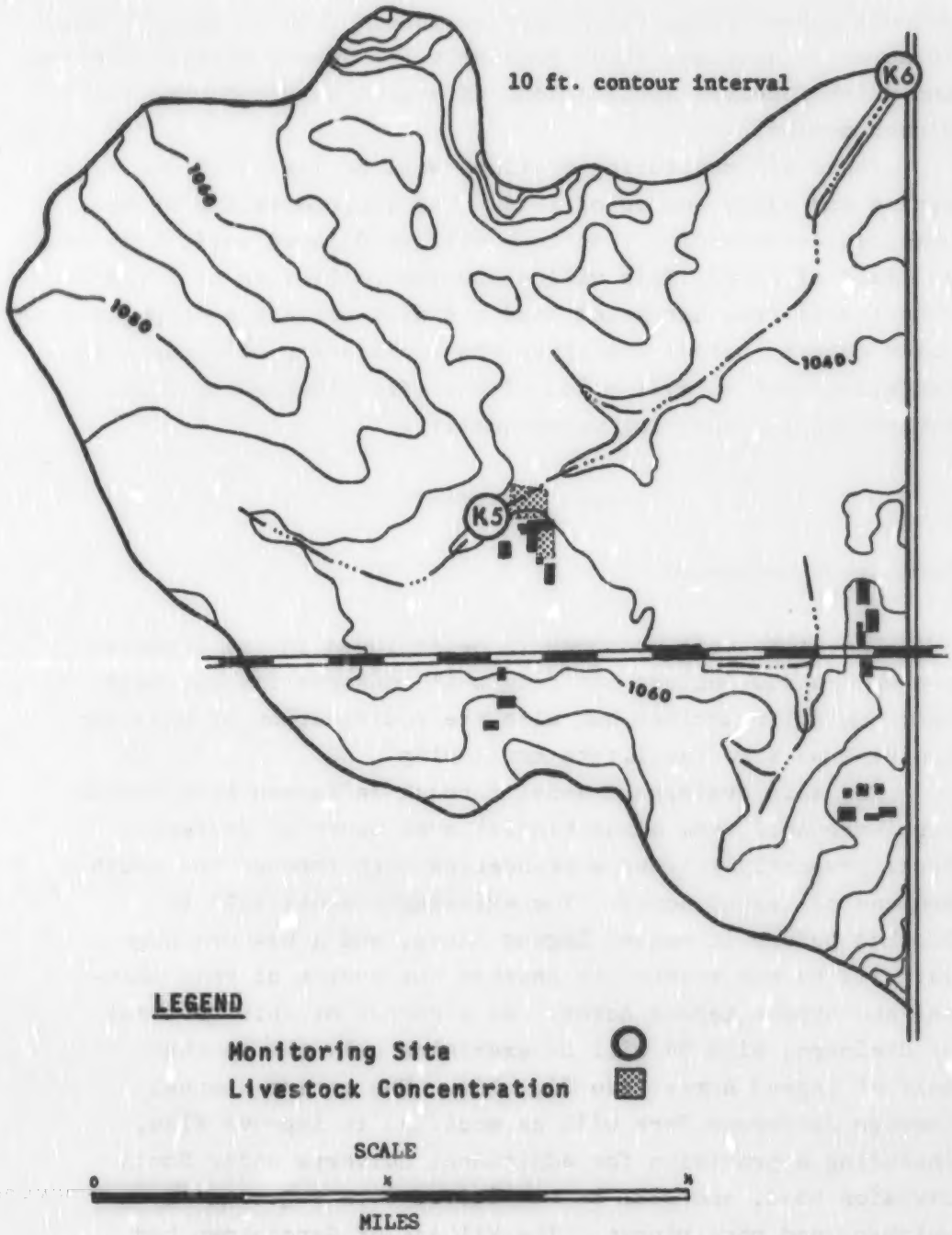



FIG. 14 Kewaskum Subwatershed (K-South) showing location of monitoring sites.

K-South subwatershed which carries runoff from an area of about 70 acres of cropland which presently has severe erosion problems and which receives applications of animal manure during the winter months.

These six monitoring stations will be installed during the spring and early summer of 1975. The implementation of the selected conservation practices will be delayed until late summer and fall of 1976. This will allow the collection of a year's runoff data from untreated land and will provide a comparison of water quality before and after the application of conservation techniques and an evaluation of the effectiveness of these techniques in improving water quality.

## Land Treatment

### Germantown watershed

Land treatment measures to be employed in the urbanizing watersheds include not only soil conservation and sediment control practices but also the modification of existing drainage ways to facilitate monitoring.

The main drainage channel through Jefferson Park, which carries runoff from a substantial area south of Jefferson Park, presently follows a meandering path through the southern end of Legend Acres. The existing channel will be blocked before it enters Legend Acres, and a new drainage way will be constructed to shorten the course of this channel and bypass Legend Acres. As a result of this reversal of drainage, site G4 will be examining only the southern half of Legend Acres (see Fig. 10). The entire channel through Jefferson Park will be modified to improve flow, including a provision for additional culverts under South Division Road, and will be stabilized with vegetation, mulches, and rock riprap. The Village of Germantown had planned to make these modifications eventually, perhaps over a period of several years, as development of the area dictated. To provide a stable channel that will not be subject

to future modifications, and thus to facilitate the collection of meaningful water quality data, this work will be completed at the earliest possible date and before the installation of sites G2 and G4. Similar channel modification and stabilization, on a smaller scale, will be carried out on the drainage ways serving the northern portion of Legend Acres and the industrial park.

The measures to control erosion and sediment will consist basically of mulches and vegetation to reduce erosion and sediment settling basins to remove eroded materials from the runoff water. Initially, a protective cover of vegetation will be established on the entire area to be treated. This will be followed by grading, sloping, fertilizing, mulching, seeding, and sodding as required to reestablish vegetation on lands disturbed in street construction, installation of public utility services, and the excavation of basements. Disturbed areas that are scheduled for additional disturbance within a short period of time will be proteced by mulches alone, with no attempt to establish a plant cover.

Since some erosion is probably unavoidable, sediment retention basins will be constructed at the exit of the drainage ways from the treated areas. These structures will temporarily detain and thereby dissipate the energy of surface runoff, allowing much of the suspended sediment to settle out. Diversion channels to direct runoff waters into sediment basins to reduce the erosion capacity of runoff waters by shortening the effective slope length, or for such other purposes as circumstances and project objectives may dictate, may also be constructed. A tabulation of the estimated land treatment and water pollution abatement measures to be employed in the urbanizing watershed is given in Table 4. Urban development in Germantown proceeds in a controlled and orderly manner, in accord with a detailed and comprehensive plan. Land treatment measures and water quality monitoring are therefore constrained both in space

Table 4. Conservation needs inventory and estimated cost of land treatment practices in the Germantown and Kenaskum Watersheds

| Site | Engineering cost, $ | Flood routing[a] cost, $ | Preliminary treatments: Earthmoving ft³x10³ | $ | Finish grading ft²x10³ | $ | Final treatments: Seeding ft²x10³ | $ | Mulching ft²x10³ | $ | Sodding ft²x10³ | $ | Sediment basin No. | $ | Diversion terraces ft | $ | Total $ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GERMANTOWN WATERSHED** | | | | | | | | | | | | | | | | | | |
| **Jefferson Park** | | | | | | | | | | | | | | | | | | |
| Main drainageway | 4,800 | 1,300 | 26 | 17,300 | 528 | 8,500 | 528 | 15,700 | 293 | 6,600 | - | - | - | - | - | - | 54,200 | |
| North Legend Acres drainageway | 880 | - | 7 | 4,700 | 66 | 1,100 | 66 | 2,000 | 66 | 1,500 | - | - | - | - | - | - | 10,180 | |
| South Legend Acres | 1,400 | - | - | - | 80 | 1,300 | 125 | 14,400[b] | 300 | 6,700 | 5 | 1,300 | 1 | 4,000 | 1,000 | 1,100 | 30,200 | |
| Middle Old Farm (27 lots) | 1,100 | - | - | - | 50 | 800 | 95 | 6,800[b] | 180 | 4,000 | 3 | 700 | 1 | 4,000 | 250 | 300 | 17,700 | |
| | | | | | | | | | | | | | | | | | | 112,280 |
| **Industrial Park** | | | | | | | | | | | | | | | | | | |
| Drainageway | 1,300 | - | 10 | 6,700 | 100 | 1,600 | 100 | 3,000 | 100 | 2,200 | 1 | 300 | - | - | - | - | 15,100 | |
| Treated area | - | - | - | - | 100 | 1,600 | 626 | 33,200[b] | 1,300 | 26,700 | 1 | 3,000 | 1 | 4,000 | 1,000 | 1,100 | 69,600 | |
| | | | | | | | | | | | | | | | | | | 84,700 |
| | | | | | | | | | | | | | | | | GERMANTOWN TOTAL | | 196,980 |

| Farm no. | Conservation cropping, acres | Residue management, acres | Contour strip-cropping acres | $ | Diversion or field terraces ft | $ | Minimum tillage acres | $ | Grassed waterways ft | $ | Manure storage facilities No. | $ | Stone fence removal[c] ft | $ | Ponds No. | $ | Total $ | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **KENASKUM CREEK WATERSHED** | | | | | | | | | | | | | | | | | | |
| **Kenaskum North (K-North)** | | | | | | | | | | | | | | | | | | |
| 1 | 60 | 60 | 60 | 640 | - | - | - | - | 400 | 400 | - | - | 3,300 | 6,600 | 1 | 2,700 | 10,340 | |
| 2 | 61 | 61 | 15 | 160 | - | - | 61 | 450 | 650 | 650 | - | - | - | - | - | - | 1,260 | |
| 3 | 85 | - | 60 | 640 | 1,100 | 1,200 | - | - | 3,500 | 3,500 | 1 | 10,700 | 2,200 | 4,400 | - | - | 20,440 | |
| 4 | 6 | - | - | - | - | - | - | - | 1,100 | 1,100 | 1 | 10,700 | - | - | - | - | 11,800 | |
| 5 | - | - | - | - | - | - | - | - | - | - | 1 | 10,700 | - | - | - | - | 10,700 | |
| 6 | - | - | 90 | 960 | - | - | - | - | 800 | 800 | 1 | 10,700 | - | - | - | - | 12,460 | |
| | | | | | | | | | | | | | | | | | | 67,000 |
| **Kenaskum South (K-South)** | | | | | | | | | | | | | | | | | | |
| 7 | 57 | - | 37 | 400 | - | - | - | - | - | - | - | - | 1,000 | 2,000 | - | - | 2,400 | |
| 8 | - | - | - | - | 600 | 700 | - | - | - | - | - | - | - | - | - | - | 700 | |
| 9 | - | 48 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 2,700 | 2,700 | |
| 10 | 25 | - | - | - | - | - | - | - | - | - | 1 | 10,700 | - | - | - | - | 10,700 | |
| 11 | 75 | - | 75 | 800 | - | - | - | - | 1,500 | 1,500 | - | - | - | - | - | - | 2,300 | |
| | | | | | | | | | | | | | | | | | | 18,800 |
| | | | | | | | | | | | | | | | | KENASKUM TOTAL | | 85,800 |
| | | | | | | | | | | | | | | | | PROGRAM GRAND TOTAL[d] | | $282,780 |

[a] Flood routing to be accomplished by SEWRPC.
[b] Initial seeding is computed at $200/acre.
[c] Stone fence removal to allow installation of contour strip-cropping systems or diversion terraces.
[d] Differs from land treatment total shown in budget ($310,000) to allow $27,220 as a contingency for land treatments which cannot be predicted.

and in time by circumstances beyond the control or influence of project participants.

Kewaskum watershed

The land treatment measures to be evaluated by water quality monitoring include techniques for controlling pollutants from both cropland and livestock operations. Erosion control measures generally consist of crop cultural practices, special uses of living and dead vegetative materials, the use of structures for controlling the flow of surface waters, and combinations of these. Protection of water quality from the deleterious effects of the great amounts of manure and bedding produced by concentrating livestock in barns, barnyards and feedlots will be achieved through the use of manure storage facilities, surface water control practices and properly timed disposal by field spreading.

A tabulation of the land treatments and water pollution abatement measures to be employed is given in Table 4. These measures will be designed and applied in accordance with the SCS Technical Guide. Manure storage facilities will be designed and installed in accordance with SCS engineering criteria and WDNR regulations.

## Installation of Monitoring Equipment

Station G1 (Fig. 10) will be constructed, instrumented and maintained under a subcontractual agreement with the USGS. It will consist of: a. a concrete weir or flume and associated embankments to control flow, b. a digital stage recorder, stripchart recorder, timer, and bubble-gage monometer to record flow, c. an automatic stage-activated water sampler to take water and suspended sediment samples, and d. a 10x12x8 ft heated, insulated building, provided with electrical power for housing the electronic monitoring equipment.

The installation and maintenance of the remaining stations will be subcontracted to Washington County.

Technical assistance will be provided by UWEX. The UWEX staff is knowledgeable in the monitoring of small watersheds and has successfully installed and operated similar monitoring stations on the White Clay Lake Watershed in Shawano County.

These stations, like G1, will contain a flow control structure such as a weir or flume with a continuous stage height recorder on an automatic water sampler. The flow control device will be calibrated so that flow volume can be derived directly from stage height. The sampler will be triggered by stage height.

## Monitoring Program

All of the monitoring sites will be on intermittent streams or drains on streams with very low base flow. Most, if not all, of the flow at these sites will consist of storm water or snow melt runoff. The volume of flow will be measured continuously at all sites. To insure the accuracy of the data the monitoring equipment will be designed and maintained and the measurements made in accordance with standard USGS methods and/or procedures outlined in Agriculture Handbooks Nos. 224 (7) and 268 (8).

An increase in stage height above any base flow due to a runoff event will activate an automatic water sampler which will collect samples at predetermined intervals until the flow subsides. The samplers will have the capability to increase or decrease sampling frequency in proportion to flow, and the relationship between sampling frequency and flow at each site will be determined by the characteristic hydrograph at the site. Sampling frequency will be higher on streams or drains with steeper gradients or which drain smaller areas, or areas with a higher proportion of impervious surface. At sites on continuously flowing streams, base flow will also be sampled periodically, perhaps twice a month, depending upon variability of flow and water quality parameters.

Immediately after each runoff event, i.e., within 24 hours, samples will be picked up from each monitoring site by

a Washington County employee, and the samples transported for analysis to the laboratory services section of the WDNR. Sample analysis will be subcontracted to WDNR after pick-up, and prior to analysis, the samples will be maintained at 4°C.

Precipitation frequency, intensity, duration, and volume will be monitored with recording rain gages placed at several sites throughout the watersheds. Periodically, freshly collected precipitation samples will also be sent to the laboratory for analysis.

## Parameters to be Measured

Stage recorders will provide quantified flow data; samples of base flow and of runoff events will be analyzed for a variety of parameters to determine the loading of suspended sediment, the major dissolved salts, nutrients, and organic carbon. On a seasonal basis the organic carbon content and resultant oxygen demand of the runoff water will be further quantified, and concentrations of pesticides and heavy metals will be determined.

The concentrations of substances in runoff water result from the many varied processes by which these materials are transported across the sediment (or soil)-water interface. By coordinating the project's efforts with those of investigators in other disciplines at the University of Wisconsin, attempts will be made to quantify these processes. To this end, samples of watershed soils and streambed sediments will be taken and characterized in the laboratory.

Periodically, precipitation samples will also be analyzed for nutrients, organic carbon, pesticides, and heavy metals.

The specific analyses to be carried out on runoff water, sediment, soil, and precipitation are detailed in Table 5.

## Table 5. Water quality parameters to be evaluated

| Frequency of Analyses | Analyses[a] | | |
|---|---|---|---|
| | On water samples | | |
| | Unfiltered | Filtered[b] | By Difference |
| Routinely | Total solids | Dissolved solids | Suspended solids |
| | Total N | Dissolved $NH_4$-N | Organic N[c] |
| | | Dissolved ($NO_2$+$NO_3$)-N | |
| | | Dissolved $NO_2$-N[d] | |
| | Total P | Dissolved reactive P | Particulate P[e] |
| | | Dissolved organic C | |
| | | Dissolved chlorides | |
| | | Conductivity | |
| Seasonally | Total organic C | Alkalinity | |
| | Chemical oxygen demand | Dissolved Ca, Mg, Na, K | |
| | | Dissolved $SO_4$-S | |
| | | Dissolved $NO_2$-N[f] | |
| | Total pesticides[g] | Dissolved pesticides[g] | Particulate pesticides[g] |
| | Total heavy metals[h] | Dissolved heavy metals[h] | Particulate heavy metals[h] |
| | On precipitation samples | | |
| | Unfiltered | Filtered | By difference |
| Seasonally | Total N | Dissolved $NH_4$-N | Organic N[c] |
| | | Dissolved ($NO_2$+$NO_3$)-N | |
| | Total P | Dissolved reactive P | Particulate P[e] |
| | Total pesticides[g] | | |
| | Total heavy metals[h] | | |
| | On soil and sediment samples | | |
| | Air Dried | | |
| Initial characterization of soils and annual or semi-annual characterization of streambed sediments | Particle size distribution | | |
| | Total N | | |
| | Exchangeable $NH_4$-N | | |
| | ($NO_3$+$NO_2$)-N | | |
| | Available P | | |
| | Organic matter | | |
| | Cation exchange capacity | | |
| | pH | | |
| | Pesticides[g] | | |
| | Heavy metals[h] | | |

[a] All analyses will be performed by the laboratory services section of WDNR except those seasonal analyses for pesticides and heavy metals, and characterization of soils and sediments which will be carried out by the University of Wisconsin Department of Soil Science.

[b] Filtered through No. 42 Whatman.

[c] Total N minus inorganic N forms.

[d] From stations monitoring drainage from livestock operations.

[e] Total P minus dissolved reactive P--this assumes the absence of any dissolved nonreactive P.

[f] From all stations.

[g] Specific pesticide analysis will be determined by history of pesticide applications in the watersheds.

[h] Pb, Cd, Cu, Hg, Zn, Cr, B.

## Methods of Analysis

As previously mentioned, sample analysis will be carried out by WDNR. Laboratory analytical techniques will follow the standardized procedure described in the U.S. EPA Analytical Methods Manual (9). These same procedures will be used by WDNR in the analytical work for the IJC Menomonee River pilot watershed study. The adoption of standard techniques will ensure data comparability between the two projects and provide the greatest opportunity for integration of data on a region-wide basis.

## Data Analysis, Storage and Retrieval

The stream flow data will be subjected to statistical analysis to develop flow duration curves and high and low flow discharge frequency relationships, which will be correlated with precipitation patterns.

From this information and the concentrations of various constituents in the water, calculations will be made of the loading rates of sediment, nutrients, etc., per unit of watershed area, as a function of precipitation and stream flow characteristics. These relationships will be evaluated and compared for runoff from treated and untreated watersheds. Coordination of data processing will be provided by the WDNR. In order to be compatible with related Basin studies, all data from the project will be formatted in compliance with EPA guidelines and will be submitted on a regular basis to the EPA STORET system, in the Decimal Input (DIP) format. Tape or disk files will provide security backup for prevention of accidental data destruction and will be available for in-house data analysis and simulation.

In addition to raw data files, it is envisioned that summary files, subfiles of specific parts of the data and other files as necessary for informational analysis will be created as needed by project participants. Suitable forms

of data reporting and computer analyzed output, including tables and plots, will be supplied as needed to support project objectives and will be available for project reports.

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## 2. DEVELOPMENT OF A PLANNING AND MANAGEMENT PROGRAM FOR SEDIMENT CONTROL

This objective is concerned with the development of a planning and management program for sediment control on a county-wide basis under the guidance of appropriate state and federal institutions. This will involve basically the preparation of an array of alternatives for the consideration of decision makers at appropriate levels of government covering such things as institutional mechanisms, legal frameworks, regulatory approaches, and methodologies for implementation developed by project personnel in working associations with local leaders and staffs of state agencies and institutions.

At this time, the legal framework under which sediment regulation might best operate is not defined. The problem might be handled directly by county government with increased professional support staff to provide technical backup and with policy direction coming from the soil and water conservation district supervisors whose membership can be broadened to insure urban representation under Chapter 92, Wisconsin Statutes, "Soil and Water Conservation District Law". It is possible, however, that the best long-range mechanism for sediment control might be one similar to Wisconsin's shoreland-floodplain management program which was initiated by the state and obliges each county to develop its own programs within overall state guidelines. These two alternatives, as well as other possibile approaches to the sediment control problem, have pros and cons, and the objective of the project will be to evaluate the several approaches from an economic, governmental, legal, and technical standpoint in order to arrive at a feasible process for resolving the sediment control problem.

Initially, a review and evaluation of the existing statutory framework within the State of Wisconsin will be undertaken. Questions to be analyzed include, "What constraints, if any, exist at the state level to the development of a county-wide regulatory mechanism?" and "What legal

constraints, if any, exist at the county level to the development of a regulatory mechanism which will cover both incorporated and unincorporated areas?"

The examination will propose legal solutions to any statutory problems that might exist and will outline the legal framework necessary for establishing a regulatory mechanism. Further, the work will examine existing governmental organization, particularly county level government, and suggest possible approaches to implementation.

A second review effort will be aimed at analyzing ongoing sediment control programs in other states and their counties. Primary emphasis will be on those areas located within the Basin although it may be necessary to review experiences in other areas such as the states of Maryland, Iowa and Fairfax County, Virginia. Representative programs will be selected for detailed study. Legislative histories of these programs will be reviewed, support and opposition will be identified, and institutional conflicts encountered during enactment will be analyzed.

These operative statutes and administrative regulations will be examined to determine the breadth of their coverage and the processes of implementation. Analyses of enforcement powers granted regulatory agencies and inducements for accomplishing program objectives will also be made. The effectiveness of the specific programs will be looked at in detail, and their successes and failures documented.

It is also within the scope of this study to review, in selected instances, sediment control proposals that failed to be enacted into law. Again, interest groups, both pro and con, should be identified and an effort made to determine why specific proposals were defeated.

An analysis of the possible impact of related state and federal programs on the Washington County Project would also be germane to this review. Examples of such programs are the Coastal Zone Management Act (P.L. 92-583), the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), and any federal land use planning legislation, if enacted.

This study will be based on reviews of legislative histories, interviews with key legislative staff people and elected officials and with agency personnel charged with administering sediment control programs, and on-site visits to selected program areas.

A summary to be developed will take into consideration the full array of alternatives that have been identified for sediment control so that the policymakers to whom this material is presented for action can make their decisions based on their review of several feasible options. This summary will include supporting legal documentation.

To aid policymakers in their deliberations, additional background information on the social, political, and economic implications of the proposed sediment control alternatives must also be developed. Attitudes of local people toward environmental problems in general and sediment pollution problems specifically must be carefully examined. A thorough analysis of the costs and benefits of various sediment control alternatives will be made and a range of inducement possibilities suggested.

Potentials for funding, both public and private, must be evaluated. In this context, it is essential to review existing cost sharing programs in rural areas to determine their strong and weak points and their successes and failures. Information gleaned from this review of regulatory programs in other areas will also be of value in this effort.

It is anticipated that much of the previously described background information will be assembled within the first year of the project. Development of an effective planning and management program for sediment control should be viewed as a continuing problem-solving process involving project personnel, state agency staff, decision makers, and local citizens. To assist project personnel, a group of advisors, consisting of officials of the town of Kewaskum, the Village of Germantown, the Washington County Board, and the State Board of Soil and Water Conservation Districts, will be utilized.

The goal of this part of the project, therefore, will be to provide those public officials responsible for establishing a regulatory mechanism for sediment control with a series of alternatives for dealing with sediment control problems and with sufficient backup information on these alternatives to assist them in selecting the most feasible approach to solving their particular sediment control problem. Clearly, the process involves continuous participation of project personnel with citizens and decision makers. Time frames for these activities are difficult to predict although decisions can and will be reached through coordinated efforts of all involved parties.

## 3. PERSONNEL, TECHNICAL AND FINANCIAL REQUIREMENTS

This section of the report is concerned with identifying resources at the local, state and regional level required to implement the various alternatives developed as a result of Objective 2 and necessitates close collaboration between all participants involved. The importance of this component cannot be overlooked, for in part it will determine the economic acceptability of the different alternatives and become increasingly more critical when the results of this project are implemented on a regional basis. In general it may be assumed that these resources will consist of personnel and backup support. The amount or level of personnel required at the local, state or regional level is less well-known than the type of personnel required. Potential areas of need might include legal, technical, clerical, administrative, regulatory or enforcement, education and information dissemination, and political. Not only is it necessary for the project participants to define the level and types of new personnel required, it is perhaps most important to clearly define their roles and relationship to existing personnel presently employed by such agencies as SCS, SEWRPC, UWEX, WDNR, and BSWCD. Identification of the resources required must be evaluated closely so that coordination at the local, state and regional level is insured. Obviously, identification of these resources at this time is premature; however, the methodology used in identifying these resources can be described.

Development of the resource needs will be accomplished by the project staff in collaboration with project participants. This needs inventory, not only from a personnel requirement but cost of program administration, will be developed for each alternative identified and will include needs at the local, state and regional level in Objective 2. Information and input into this objective will be derived from consultations, conferences, workshops, and educational programs involving local, state and federal agencies,

organizations, and interested citizens. Continuous review and revision of this aspect will result as new information is developed through activities directly associated with this or closely related objectives.

## 4. EDUCATION AND INFORMATION PROGRAM

The goal of the educational phases of the project is to have a diverse group of target audiences--local, state, multi-state and national--be made aware of alternative solutions to the sediment problem in rural and urbanizing areas. The purpose is to have these audiences modify their attitudes and behavior on a long-term basis so that sediment control is substantially increased and sediment pollution of the nation's waters is reduced.

Within this broad goal several specific operational objectives become important.

- °Increase public awareness and understanding of the problems caused by sediment in streams.
- °Increase public awareness and understanding of the full range of possible preventive and corrective measures for solving these problems.
- °Improve public awareness among a wide variety of individuals and groups of the purposes, progress and significant findings of the Washington County Project.
- °Provide opportunities through which various segments of the public can observe results of the project and project activities.
- °Provide forums through which the public can participate in formulating and reviewing specific aspects of the project.
- °Provide forums through which the public can participate in implementing specific program recommendations such as land use planning and land use regulations.
- °Provide educational materials which can serve to transfer information and methodology to other appropriate geographic areas.

### Level of Activity Needed

M. Frank Hersman, Director of the Office of Intergovernmental Science and Research Utilization, National Science Foundation, has pointed out clearly the need for active programs to disseminate new information from research and

demonstration projects and has encouraged less reliance upon the passive techniques of collecting, indexing and disseminating scientific and technical information upon the specific request of a potential user. The educational phase of this project is designed to be dynamic and active. Hersman has also pointed out the pitifully small level of support for educational phases of research and development projects. In this connection a portion of the recent publication, "Technology Transferring Utilization: Recommendations for Redirecting the Emphasis and Correcting the Imbalance", by the National Academy of Engineering is relevant.

> "The federal government should not simply tell you all there is about promising technology; it should concentrate instead on actually transforming technical information into ultimate uses that fulfill public or private socio-economic needs. This will likely require one billion dollars annually, not the forty three million currently being spent."

The education and information phase of this project is planned to be an active and practical multi-level program in the sense described in the material quoted above.

## General Description of Proposed Work

An active, client-centered, problem-oriented educational program requires six major steps:

- °Identification of target audiences or clientele groups.
- °Identification of needed learning experiences to bring about changes in attitudes and behavior for each target audience.
- °Planning of educational programs with selected members of each target audience.
- °Development of necessary educational materials in a form comprehensible to the user.
- °Systemative execution of the planned educational program.
- °Continual evaluation of the program.

A project such as the one in Washington County must relate to a large number of target groups and clientele. A preliminary listing of these is identified in Table 6.

Table 6. Examples of target clientele and respective audience groups

| Target Clientele[a] | | |
|---|---|---|
| **LOCAL (Within Washington County)** | | |
| ° News media | ° Committees of the Washington County Board | ° Town Boards |
| ° Service Clubs | °° Soil and Water Conservation District Supervisors | ° City and Village Councils |
| ° Voluntary organizations concerned with environment, natural resources, community development, taxation, etc. | °° Planning and Zoning Committee | ° Schools - primary and secondary |
| | °° Extension Education Committee | ° Others (to be selected) |
| **Southeast Wisconsin Counties** | | |
| ° Regional Planning Commission | ° County Boards in Southeastern Wisconsin | ° Region-wide voluntary organizations |
| ° Area Association of Soil and Water Conservation Districts | ° Multi-county watershed associations | ° Federal and state agencies dealing with natural resources |
| ° Southeast District - Wisconsin Association of Agriculture and Extension Education Committees, Inc. | ° District office of Wisconsin Department of Natural Resources | |
| **STATE** | | |
| ° Wisconsin Agricultural and Extension Education Committees, Inc. | ° State agencies - selected staff | ° Wisconsin Environmental Education Council |
| ° Wisconsin County Boards Association | °° Department of Natural Resources | ° Federal agencies dealing with natural resources |
| ° Wisconsin Association of Conservation Districts | °° Department of Local Affairs and Development | ° Statewide news media |
| ° League of Women Voters of Wisconsin | °° Department of Administration | |
| | °° Department of Public Instruction | |
| | ° Natural Resources Council of State Agencies | |
| **MULTI-STATE** | | |
| ° SWC Districts throughout the Great Lakes Region | ° Upper Mississippi Area of NACD | ° Federal and state agencies in Great Lakes Basin |
| **NATIONAL** | | |
| ° National Association of Counties | ° US Department of Agriculture | ° US Army Corps of Engineers |
| ° National Association of Conservation Districts | °° Soil Conservation Service | ° US Department of Health, Education and Welfare |
| ° Federal agencies dealing with natural resources | °° Agricultural Stabilization and Conservation Service | ° US Dept. of Housing and Urban Development |
| ° U.S. Environmental Protection Agency | °° Farmers Home Administration | |
| | °° Federal Extension Service | |
| | ° US Department of the Interior | |
| | °° Geological Survey | |
| | °° Bureau of Sport Fisheries and Wildlife | |
| **INTERNATIONAL** | | |
| ° International Joint Commission and related entities | | |

[a]For full definition of abbreviations see Table 1 (page 2).

Most of these groups will require a unique educational program in order to achieve the goals and objectives. Therefore, one operational education plan cannot be written--now or in the future. Instead, a series of plans must be prepared as the project proceeds with the people in the target clientele group as definitive participants in the development of the program.

The process for this is transferable. It is demonstrated in Table 7, using the county boards as an example, how this methodology of education and information dissemination can be expanded from a local target audience through the national level. The educational needs for each audience or client group would be developed jointly in a practical manner. Following this, the activities and events, such as tours, briefings, meetings, and mass media presentations, would be developed and presented in sequences appropriate to the teaching objectives previously identified. Evaluation--both formal and informal--would be carried on throughout. Table 7 also lists the approximate duration of each activity or event as well as the responsibilities to be assumed. A similar kind of planning and scheduling format will be developed for each target client or audience group (or for appropriate closely related groups) such as those listed in Table 6. The education and information work unit of the project will develop overall plans and work with staff of the project and cooperating agencies to ensure completion.

This active, analytical and systemized approach to adult education is one which has high potential for producing behavioral changes among individuals and groups needed to more adequately control sediment pollution of not only streams in Washington County but throughout the state, Basin and nation.

Table 7 Example of a Teaching and Activity Outline

| Audience or client group | Needs for education | Teaching objectives | Activities & events: Type and scope | Activities & events: Time or duration | Responsibility: Lead | Responsibility: Cooperators |
|---|---|---|---|---|---|---|
| • Washington County Board Committees<br>•• SWCD<br>•• Planning<br>•• Ext. Education<br>• County Board | • Understand Project<br>• Advise & Counsel in project development<br>• Consider facts on policies & issues and their consequences | • Acquaint County Board Members with project | • Tours, briefings, and reports to committees | • Throughout project | • County Ext. Staff | • All agencies |
| | | • Allow Board to advise on project development | • Advisors Committee meetings | • Throughout project | • Local Coordinator[a]<br>• County Ext. Staff | • County Extension SEWRPC SCS<br>• Total project staff & contractors |
| | | • Give facts on project findings in terms of alternate policies & their consequences | • "Public policy" meetings for committees & entire county board | • 1976 1977 | | |
| • Wisconsin County Boards Association | • Become generally familiar with project<br>• Understand implications of project for state | • Acquaint key county board members (statewide) with project | • Articles<br>• Presentations at state meetings<br>• Tours<br>• Television<br>• Movies | • 1976 1977 | • Project Director | • UWEX BSWCD staff SCS |
| | | • In-depth education for key committees of Wisconsin County Boards Association | • One or more conferences & workshops on policy issues & consequences. | • Late 1976 1977 | • Project Director | • UWEX BSWCD staff |
| • National Association of Counties<br>• National Association of Conservation Districts | • Become familiar with the implications of the Washington County Project for nationwide uses by counties and states | • Desseminate project findings throughout the nation | • Presentations at national meetings, publications in national magazines, use of films, TV shorts, slides, etc. | • 1977 1978 | • Project Director | • UWEX<br>• Extension Service USDA<br>• EPA<br>• NACD<br>• SCS |
| | • Become familiar with sources of factual information & teaching aids | • Promote nationwide action of local governments on sediment control | • Conferences & workshops for in-depth consideration of project findings | | | |

[a] Local coordinator is responsible for working with lead agencies to set priorities and general program thrusts.

## Detailed Operations

Even though a large number of audience groups are identified in Table 6 and detailed plans for working with each have not been worked out, some general directions are clear. An active program of information and education for landowners in the selected watersheds is underway, and education efforts via mass media are ongoing throughout Washington County. On the basis of these and previous experiences the project needs would be developed as follows:

- °A series of bulletins, pamphlets and brochures on various institutional and technical phases of the project for local, state and national usage.
- °Slide-tape and television series showing technical and institutional phases of project results and activities as an aid to widespread dissemination of project findings.
- °A sound, color, 16mm motion picture (suitable for use throughout the Basin and for television viewing) demonstrating the significance of this and similar projects to improve water quality in the Great Lakes.
- °Workshops and educational conferences on significant project activities and findings.

## 5. APPLICATION OF RESULTS TO OTHER AREAS

The development of a sediment control management plan for Washington County will serve as a demonstration of technical and institutional mechanisms for conducting a county-wide, rural-urban program. The demonstration must, however, achieve the goal of being implementable on a much broader geographic scale, i.e., statewide, Great Lakes region or national. It is fully understood that this demonstration can only serve as a basic prototype since other areas will have to develop programs taking into account political, legal and economic constraints placed upon them.

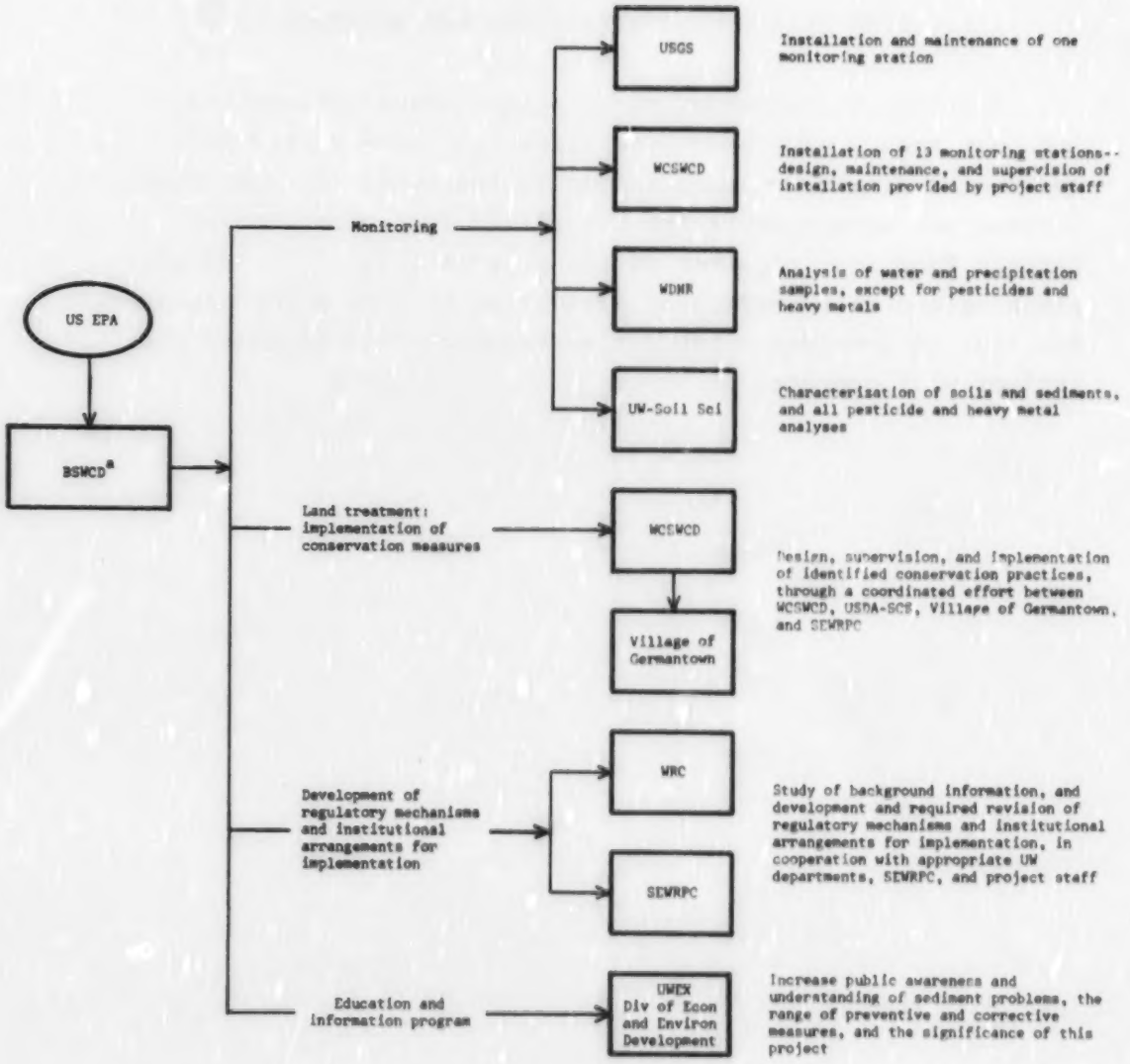
The important role that project personnel can play in disseminating information on the Washington County Project

has already been alluded to in the description of the education program. Workshops oriented to very practical considerations of such a program could be developed and presented in appropriate locations after the clientele needing and using the information have been identified. The practical types of workshops would include discussions of the technical and institutional mechanisms attempted with evaluations of those processes that led to successful implementation and those processes that did not. In cases where information has been obtained relating to institutional arrangements in other states, these would be highlighted in relationship to the success or failure that such arrangements might have encountered in Washington County. Field demonstrations would be made an important aspect of the workshops. At the national level, attempts would be made to hold a symposium on erosion control methodologies (technical and institutional) concomitant with the annual meeting of the Soil Science Society of America in 1979.

In line with the role of the Water Resources Center in disseminating information through the office of Water Research and Technology network and the role of NACD in providing information to states on a regional basis, audiences for sediment control information will be carefully defined and the information packaged in a form that is comprehensible to the particular audience identified. Information is frequently packaged in forms that are so technical as to be unintelligible to the recipient, and a particular effort will be made in the Washington County program to avoid these pitfalls.

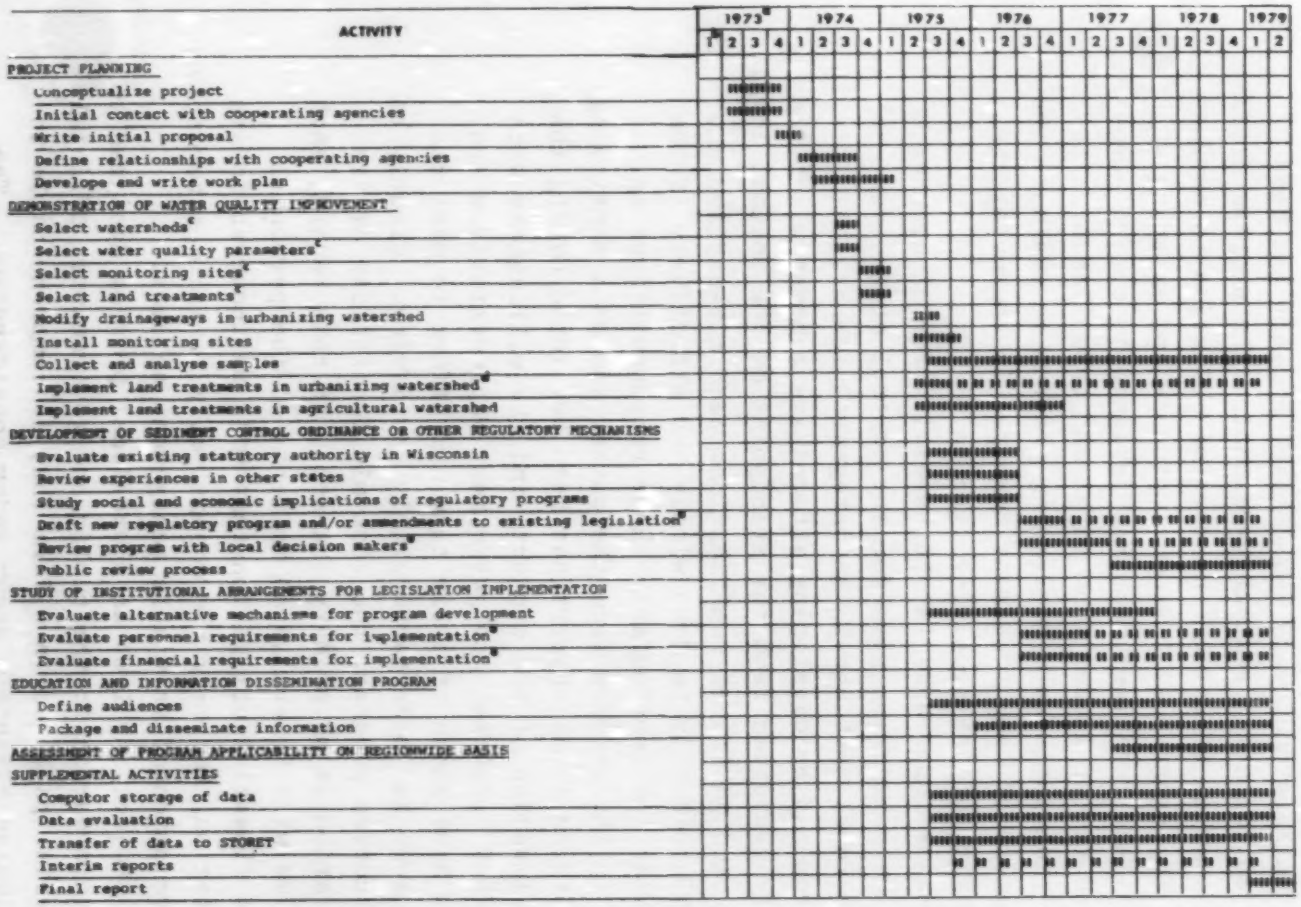
## E. TIME FRAME AND CONTRACTURAL ARRANGEMENTS

Individuals representing agencies, organizations and interest groups have been identified and incorporated into work units directed toward accomplishing specific objectives. Contractual arrangements are identified for accomplishing certain functions required of the program (Fig. 15). Careful planning and coordination of activities have been demonstrated, and Fig. 16 provides a broad time sequence through which the project will operate.


US EPA
BSWCD[a]
Monitoring
USGS
Installation and maintenance of one monitoring station
WCSWCD
Installation of 13 monitoring stations--design, maintenance, and supervision of installation provided by project staff
WDNR
Analysis of water and precipitation samples, except for pesticides and heavy metals
UW-Soil Sci
Characterization of soils and sediments, and all pesticide and heavy metal analyses
Land treatment: implementation of conservation measures
WCSWCD
Village of Germantown
Design, supervision, and implementation of identified conservation practices, through a coordinated effort between WCSWCD, USDA-SCS, Village of Germantown, and SEWRPC
Development of regulatory mechanisms and institutional arrangements for implementation
WRC
SEWRPC
Study of background information, and development and required revision of regulatory mechanisms and institutional arrangements for implementation, in cooperation with appropriate UW departments, SEWRPC, and project staff
Education and information program
UWEX Div of Econ and Environ Development
Increase public awareness and understanding of sediment problems, the range of preventive and corrective measures, and the significance of this project
LEGEND
Contractor

[a]By Wisconsin statutes, UW administers and provides staff for BSWCD.

**Figure 15 Contractual Arrangements**


ACTIVITY
1973[a]
1974
1975
1976
1977
1978
1979
1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2 3 4 1 2
PROJECT PLANNING
Conceptualize project
Initial contact with cooperating agencies
Write initial proposal
Define relationships with cooperating agencies
Develope and write work plan
DEMONSTRATION OF WATER QUALITY IMPROVEMENT
Select watersheds[c]
Select water quality parameters[c]
Select monitoring sites[c]
Select land treatments[c]
Modify drainageways in urbanizing watershed
Install monitoring sites
Collect and analyse samples
Implement land treatments in urbanizing watershed[d]
Implement land treatments in agricultural watershed
DEVELOPMENT OF SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISMS
Evaluate existing statutory authority in Wisconsin
Review experiences in other states
Study social and economic implications of regulatory programs
Draft new regulatory program and/or ammendments to existing legislation[e]
Review program with local decision makers[e]
Public review process
STUDY OF INSTITUTIONAL ARRANGEMENTS FOR LEGISLATION IMPLEMENTATION
Evaluate alternative mechanisms for program development
Evaluate personnel requirements for implementation[e]
Evaluate financial requirements for implementation[e]
EDUCATION AND INFORMATION DISSEMINATION PROGRAM
Define audiences
Package and disseminate information
ASSESSMENT OF PROGRAM APPLICABILITY ON REGIONWIDE BASIS
SUPPLEMENTAL ACTIVITIES
Computor storage of data
Data evaluation
Transfer of data to STORET
Interim reports
Final report

[a] calender year
[b] quarter
[c] actually part of planning phase
[d] continuous, as land is disturbed
[e] continuous process of review and modification

FIG. 15. Time schedule of activities.

## F. SUMMARY

The Washington County (Wisconsin) Project has been designed to conduct a reasearch-demonstration program dealing with the control of diffuse sources of pollution to surface waters. The program will demonstrate new and existing effective land treatment measures designed to control erosional and runoff losses from rural and urban lands. The demonstration includes a monitoring program to evaluate the effectiveness of land treatment measures in improving the water quality of the receiving streams.

Of major importance is the necessity for developing a county-wide management plan for the control of sediment in urban and rural settings in an integrated manner, and this is best approached by developing alternative schemes which are thoroughly evaluated from the standpoint of the social, legal, economic, and political ramifications each alternative may hold. This can only be done wisely and effectively if the local public and particularly their representatives are involved in the process from the outset and on a continuing basis. Strong local support has been developed during the conceptualization of the project, and the willingness with which agency personnel and government representatives and officials have given of their time and effort to meet the program needs has been particularly gratifying. Clearly to be an effective program, the economic feasibility of its implementation is of primary concern. In this regard, each alternative will be evaluated in terms of the personnel needs and financial obligation that will be incurred in its implementation, and only the economically feasible alternatives will be recommended as viable management schemes.

The project involves an educational program designed to provide information to the public and governmental officials with material packaged in a form that is comprehensible to the particular clientele group under consideration. The education program will be pursued vigorously in Washington

County from the outset of the project to keep a continuous connection and stream of information flowing to the public and their representatives in local government. As information on the project is gathered, the flow of information and educational materials must be expanded to inform statewide and eventually Great Lakes region and national audiences. For the Washington County Project to be completely successful, the management methodologies proposed must be implementable on a much broader geographic base.

## G. BIOGRAPHICAL INFORMATION

Following are summaries of biographical information on the principal investigator and those persons designated as leaders of the various work units.

Name: T. C. Daniel

Title: Assistant Professor-Soil Science; Technical Coordinator, Washington County Project

Education:

| Degree | University | Date Awarded |
|---|---|---|
| B.S. | Texas A & M University | 1963 |
| M.S. | University of Wisconsin | 1966 |
| Ph.D. | University of Wisconsin | 1972 |
| Postdoc. | University of Wisconsin | 1972 |

Professional and/or Research Experience:

Teacher, Soil Science and Chemistry, School of Agriculture, Ibadan, Nigera. 1966-68

Assistant Professor, Dept. of Soil Science, University of Wisconsin. 1972--

Selected Publications:


Daniel, T. C. 1969. Soils of Western Nigeria, In Introductory Soils by D. Schmidt. Odutola Printing Works Ekotedo, Ibadan, Nigeria.

Graetz, D. A., G. Chesters, T. C. Daniel, L. W. Newland, and G. B. Lee. 1970. Parathion degradation in lake sediments. J. Water Poll. Control. Fed. 42:R76-R94.

Daniel, T. C., and G. Chesters. 1971. Design and construction of a shallow water sediment core sampler. Environ. Letters 1:225-228.

Simsiman, G. V., G. Chesters, and T. C. Daniel. 1972. Chemical control of aquatic weeds and its effect on the nutrient and redox status of water and sediment. 15th Conf. I.A.G.L.R. University of Wisconsin, Madison, Wis.

Chesters, G., H. B. Pionke, and T. C. Daniel. 1974. Sampling of soil, water and sediment for pesticide analysis, In W. D. Guenzi, ed., Pesticides and Their Effect on Soil and Water. Soil Sci. Soc. Amer., Madison, Wis.

Daniel, T. C., and J. Bouma. 1974. Column studies of soil clogging in slowly permeable soils as a function of effluent quality. J. of Env. Quality. 4:321-326.

Daniel, T. C., S. Nichols, and W. Clark. 1974. Controlling waterweeds. University of Wisconsin-Extension, Madison, Wis.

Name: Gordon Chesters

Title: Director, Water Resources Center: Professor-Soil Science, University of Wisconsin; Chairman-Water Chemistry Program

Education:

| Degree | University | Date Awareded |
|---|---|---|
| B.S. | University of Wales, G.B. | 1954 |
| M.S. | University of Wisconsin | 1956 |
| Ph.D. | University of Wisconsin | 1959 |

Professional and/or Research Experience

| | |
|---|---|
| Research Assistant, Dept. of Soil Science, University of Wisconsin. | 1954-59 |
| Postdoctoral Fellow, Dept. of Soil Science, University of Wisconsin. | 1959-61 |
| Assistant Professor, Dept. of Soil Science, University of Wisconsin. | 1961-64 |
| Associate Professor, Dept. of Soil Science, University of Wisconsin. | 1964-67 |
| Professor, Dept. of Soil Science, University of Wisconsin. | 1967-- |
| Chairman, Dept. of Soil Science, University of Wisconsin. | 1971-73 |
| Chairman, Water Chemistry Program, Advisory Committee, University of Wisconsin. | 1972-73 |
| Director, Wisconsin Water Resources Center. University of Wisconsin. | 1972-- |
| Chairman, Water Chemistry Program, Executive Committee, University of Wisconsin. | 1973-- |

Selected Publications: (Total 100)


Konrad, J. G., G. Chesters, and D. R. Keeney. 1970 Determination of organic- and carbonate-carbon in freshwater lake sediments by a microcombustion procedure. J. Thermal Anal. 2:199-208.

Graetz, D. A., G. Chesters, T. C. Daniel, L. W. Newland, and G. B. Lee. 1970. Parathion degradation in lake sediments. J. Water Poll. Control Fed. 42:R76-R94.

Chesters, G., and J. G. Konrad. 1971. Effects of pesticide usage on water quality. Invitational Symposium paper presented at the 1st National Biological Congress, Nov. 1970, Detroit, Mich., BioScience 21:565-569.

Chesters, G., J. G. Konrad, G. D. Schrag, and L. Everett. 1971. Gas chromatography: Techniques and uses in soil, plant and water analysis. Invitational chapter In: ASA Special Publication, "Instrumental methods for analysis of soil and plant tissue," pp. 129-183.

Pionke, H. B., and G. Chesters. 1972. Sediment-Water-Pesticide Interactions. J. Environ. Qual., Vol. 2, No. 1, pp. 29-45.

Name: Henry C. Hart

Title: Professor-Political Science, University of Wisconsin

Education:

| Degree | University | Date Awarded |
|---|---|---|
| B.A. | Vanderbilt University | 1936 |
| M.A. | University of Wisconsin | 1947 |
| Ph.D. | University of Wisconsin | 1950 |

Professional and/or Research Experience:

| | |
|---|---|
| Instructor, Dept. of Political Science, University of Wisconsin. | 1948-50 |
| Assistant Professor, Dept. of Political Science, University of Wisconsin. | 1950-55 |
| Associate Professor, Dept. of Political Science, University of Wisconsin. | 1955-59 |
| Professor, Dept. of Political Science, University of Wisconsin. | 1959-- |
| Director, Indian Language and Area Center, University of Wisconsin. | 1960-63 |
| Chairman, Dept. of Indian Studies, University of Wisconsin. | 1966-69 |

Selected Publications:


Hart, H. C. ADMINISTRATIVE ASPECTS OF RIVER VALLEY DEVELOPMENT. (Delhi: Indian Institute of Public Administration, 1961).

Hart, H. C. "Valley Development and Valley Administration in the Missouri Basin." PUBLIC ADMINISTRATION REVIEW, Vol. 41, pp. 1-11 (1948).

Hart, H. C. "Legislative Abdication in Regional Development." JOURNAL OF POLITICS, Vol. 13, pp. 393-417 (1951).

Hart, H. C. "Governing the Missouri." IOWA LAW REVIEW, Vol. 41, pp. 198-215 (1956).

Hart, H. C. "Crisis, Community and Consent in Water Politics." LAW AND CONTEMPORARY PROBLEMS, Vol. 22, pp. 510-537 (1957).

Name: Frederick W. Madison, Jr.

Title: Specialist, Department of Soil Science, University of Wisconsin

Education:

| Degree | University | Date Awarded |
|---|---|---|
| B.A. | University of Wisconsin | 1961 |
| M.S. | University of Wisconsin | 1963 |
| Ph.D. | University of Wisconsin | 1972 |

Professional and/or Research Experience:

| | |
|---|---|
| Project Assistant, Federal Project #912 (Research on Prairie and Red Clay Soils of Wisconsin). | 1961 |
| Teaching Assistant, Dept. of Soil Science, University of Wisconsin. | 1962-63 |
| Research Assistant, Soil Survey Division of Wisconsin Geologic and Natural History Survey. | 1962-64 |
| Legislative Assistant to Senator Gaylord Nelson. | 1967-68 |
| Special Assistant to the Federal Co-chairman, Upper Great Lakes Regional Commission. | 1969-73 |
| Specialist, Dept. of Soil Science, University of Wisconsin. | 1973-- |

Name: Patrick E. McGuire

Title: Natural Resources Specialist
Wisconsin Department of Natural Resources

Education:

| Degree | University | Date Awarded |
|---|---|---|
| B.S. | University of Wisconsin | 1970 |
| double M.S. | University of Wisconsin | 1975 |

Professional and/or Research Experience:

| | |
|---|---|
| Specialist, Dept. of Soil Science, University of Wisconsin | 1970-71 |
| Research Assistant, Dept. of Soil Science University of Wisconsin | 1973-75 |
| Natural Resources Specialist, Wisconsin Department of Natural Resources | 1976-- |

Name: Carlisle P. Runge

Title: Professor-Urban and Regional Planning, University of Wisconsin

Education:

| Degree | University | Date Awarded |
|---|---|---|
| Ph.B. | University of Wisconsin | 1946 |
| LL.B. | University of Wisconsin | 1948 |

Professional and/or Research Experience:

| | |
|---|---|
| Lake Superior Project participant. | 1971-73 |
| Wisconsin Land Resources Committee Staff. | 1972-73 |
| University of Wisconsin Extension Specialist. | 1973 |
| Project Manager United Nations-Yugoslavia Development Program. | 1973-74 |
| Professor, Dept. of Urban and Regional Planning, University of Wisconsin. | 1974-- |

Selected Publications:

Runge, C. P., and W. L. Church. New Directions in Regionalism: A Case Study of Intergovernmental Relations in Northwestern Wisconsin.

Runge, C. P. ed. Conclusions and Recommendations for Strengthened State Planning and Management of Wisconsin Lands.

Runge, C. P. A Proposal for Improving the Management of the Great Lakes of the U.S. and Canada. (Canada-United States University Seminar).

Clarenbach, F. A., H. C. Jordahl Jr., and C. P. Runge. Maintaining Wisconsin: State/Regional/Local Planning Arrangements for Land Development and Environmental Protection.

Name: Harold F. Ryan

Title: County Board Supervisor-Washington County

Education:

| Degree | University | Date Awarded |
|---|---|---|
| B.S. | University of Wisconsin-Platteville | 1953 |

Professional and/or Research Experience:

| | |
|---|---|
| District Conservationist, U.S.D.A. Soil Conservation Service. | 1944-73 |
| Interim Coordinator, Washington County Project. | 1974-- |
| County Board Supervisor, Washington County. | 1974-- |

## H. BUDGET

The estimated budgets for the project are presented on the following pages:


| Budget by Agency: | Page Number |
|---|---|
| BSWCD | 69 |
| UWEX | 69 |
| WRC | 70 |
| WDNR | 70 |
| WCSWCD | 71 |
| SEWRPC | 71 |
| USGS | 72 |
| Summary of Budget for Project | 72 |

BUDGET

BOARD OF SOIL AND WATER CONSERVATION DISTRICTS

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 36,745 | $ 32,504 | $ 34,130 | $ 35,836 | $ 18,813 | $ 158,028 |
| Fringe Benefits | 6,614 | 5,851 | 6,143 | 6,450 | 3,386 | 28,444 |
| Indirect Costs | 20,577 | 18,202 | 19,113 | 20,068 | 10,535 | 88,495 |
| Total | $ 63,936 | $ 56,557 | $ 59,386 | $ 62,354 | $ 32,734 | $ 274,967 |

BUDGET

UNIVERSITY OF WISCONSIN-EXTENSION

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 36,017 | $ 78,770 | $ 84,213 | $ 86,86[illegible] | $ 44,771 | $ 330,631 |
| Fringe Benefits | 6,686 | 13,912 | 14,606 | 15,339 | 8,066 | 58,611 |
| Indirect Costs | 18,175 | 36,917 | 39,607 | 40,711 | 20,907 | 156,317 |
| Supplies | 2,900 | 4,000 | 5,000 | 5,000 | 2,000 | 18,900 |
| Travel | 3,950 | 5,000 | 7,000 | 6,500 | 2,500 | 24,950 |
| Equipment | 500 | 10,000 | 5,000 | 2,000 | - | 17,500 |
| Other | 1,000 | 30,500 | 32,000 | 12,000 | 7,500 | 83,000 |
| Total | $ 69,228 | $179,099 | $187,428 | $168,410 | $ 85,744 | $ 689,909 |

BUDGET

UNIVERSITY OF WISCONSIN WATER RESOURCES CENTER

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 57,906 | $191,462 | $202,536 | $203,689 | $ 96,776 | $ 752,369 |
| Fringe Benefits | 8,652 | 22,251 | 23,366 | 23,211 | 10,517 | 87,997 |
| Indirect Costs | 36,689 | 110,970 | 117,383 | 118,958 | 56,105 | 440,105 |
| Supplies | 3,300 | 11,500 | 11,500 | 11,300 | 8,000 | 45,600 |
| Travel | 2,000 | 9,000 | 7,000 | 5,000 | 4,000 | 27,000 |
| Equipment | 2,000 | 51,400 | 5,000 | 5,000 | 2,000 | 65,400 |
| Other | 6,500 | 17,000 | 18,000 | 18,000 | 8,500 | 68,000 |
| Total | $117,047 | $413,583 | $384,785 | $385,158 | $185,898 | $1,486,471 |

BUDGET

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 10,222 | $ 33,538 | $ 35,209 | $ 47,168 | $ 30,107 | $ 156,244 |
| Fringe Benefits | 2,045 | 6,707 | 7,041 | 9,437 | 6,023 | 31,253 |
| Indirect Costs | 2,058 | 7,981 | 8,114 | 10,246 | 6,660 | 35,059 |
| Supplies | 2,000 | 7,000 | 6,000 | 6,000 | 3,500 | 24,500 |
| Travel | 250 | 1,000 | 1,000 | 1,000 | 1,000 | 4,250 |
| Equipment | 20,000 | 21,000 | 4,000 | 2,000 | 1,000 | 48,000 |
| Other | 500 | 7,000 | 7,000 | 7,000 | 5,000 | 26,500 |
| Total | $ 37,075 | $ 84,226 | $ 68,364 | $ 82,851 | $ 53,290 | $ 325,806 |

BUDGET

WASHINGTON COUNTY SOIL AND WATER CONSERVATION DISTRICT

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 2,580 | $ 16,232 | $ 17,046 | $ 17,896 | $ 9,393 | $ 63,147 |
| Fringe Benefits | 591 | 3,716 | 3,904 | 4,096 | 2,149 | 14,456 |
| Indirect Costs | 345 | 2,173 | 2,282 | 2,396 | 1,258 | 8,454 |
| Supplies | 200 | 1,000 | 1,000 | 1,000 | 200 | 3,400 |
| Travel | 400 | 1,200 | 1,200 | 1,200 | 600 | 4,600 |
| Equipment | 58,200 | 300 | 300 | 100 | 100 | 59,000 |
| Other | 25,000 | 247,000 | 60,000 | 25,000 | 15,000 | 372,000 |
| Total | $ 87,316 | $271,621 | $ 85,732 | $ 51,688 | $28,700 | $ 525,057 |

BUDGET

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Personnel | $ 6,535 | $ 8,000 | $ 8,400 | $ 8,820 | $ 4,630 | $ 36,385 |
| Fringe Benefits | 1,305 | 1,600 | 1,680 | 1,765 | 925 | 7,275 |
| Indirect Costs | 1,960 | 2,400 | 2,520 | 2,645 | 1,390 | 10,915 |
| Supplies | 300 | 1,000 | 1,000 | 1,000 | 1,000 | 4,300 |
| Travel | 400 | 800 | 800 | 800 | 800 | 3,600 |
| Equipment | 200 | 500 | 500 | 500 | - | 1,700 |
| Other | - | - | - | - | - | - |
| Total | $ 10,700 | $ 14,300 | $ 14,900 | $ 15,530 | $ 8,745 | $ 64,175 |

BUDGET

U. S. GEOLOGICAL SURVEY

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| Supplies | $ 500 | $ 1,000 | $ 1,000 | $ 1,000 | $ 500 | $ 4,000 |
| Equipment | 8,000 | - | - | - | - | 8,000 |
| Other | 9,500 | 7,000 | 7,000 | 7,000 | 3,500 | 34,000 |
| Total | $ 18,000 | $ 8,000 | $ 8,000 | $ 8,000 | $ 4,000 | $ 46,000 |

SUMMARY OF PROJECT BUDGET

| | 5/24/74 to 6/30/75 | 7/01/75 to 6/30/76 | 7/01/76 to 6/30/77 | 7/01/77 to 6/30/78 | 7/01/78 to 12/31/78 | Total |
|---|---|---|---|---|---|---|
| BSWCD | $ 63,936 | $ 56,557 | $ 59,386 | $ 62,354 | $ 32,734 | $ 274,967 |
| UWEX | 69,228 | 179,099 | 187,428 | 168,410 | 85,744 | 689,309 |
| UW-WRC | 117,047 | 413,583 | 384,785 | 385,158 | 185,898 | 1,486,471 |
| WDNR | 37,075 | 84,226 | 68,360 | 82,851 | 53,290 | 325,806 |
| WCSWCD | 87,316 | 271,621 | 85,732 | 51,688 | 28,700 | 525,057 |
| SEWRPC | 10,700 | 14,300 | 14,900 | 15,530 | 8,745 | 64,175 |
| USGS | 18,000 | 8,000 | 8,000 | 8,000 | 4,000 | 46,000 |
| Total | $403,302 | $1,027,386 | $808,595 | $773,991 | $399,111 | $3,412,335 |

**TECHNICAL REPORT DATA**
*(Please read Instructions on the reverse before completing)*

| 1. REPORT NO | 2. | 3. RECIPIENT'S ACCESSION NO. |
|---|---|---|
| EPA-905/9-77-001 | | |

| 4. TITLE AND SUBTITLE | 5. REPORT DATE |
|---|---|
| "Washington County Project" Development and Implementation of a Sediment Control Ordinance or other Regulatory Mechanism: Institutional Arrangements Necessary for Implementation of Control Methology on Urban and Rural Lands. | January 1977 |
| | 6. PERFORMING ORGANIZATION CODE |
| 7. AUTHOR(S) Thomas C. Daniel<br>Ralph H. Klassy | 8. PERFORMING ORGANIZATION REPORT NO. |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Wisconsin Bd. of Soil & Water Conservation Districts<br>1815 University Avenue<br>Madison, Wisconsin 53706 | 10. PROGRAM ELEMENT NO.<br>2BA645 |
| | 11. CONTRACT/GRANT NO.<br>G-005139 |
| 12. SPONSORING AGENCY NAME AND ADDRESS<br>U.S. Environmental Protection Agency<br>Office of Great Lakes Coordinator<br>230 South Dearborn Street<br>Chicago, Illinois 60604 | 13. TYPE OF REPORT AND PERIOD COVERED<br>Work Plan-May '74-Dec. 78 |
| | 14. SPONSORING AGENCY CODE |

15. SUPPLEMENTARY NOTES
Section 108(a) Program - Ralph G. Christensen
U.S. EPA Project Officer - Ralph V. Nordstrom

16. ABSTRACT
The primary objective of this project is to demonstrate the effectiveness of land control measures in improving water quality, and to devise the necessary institutional arrangements for the preparation, acceptance, adoption, and implementation of a sediment control ordinance applicable to incorporated and unincorporated areas on a county-wide basis.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENDED TERMS | c. COSATI Field/Group |
|---|---|---|
| Sediment<br>Erosion<br>Water Quality<br>Institutional<br>Socio-Economic<br>Nutrients<br>Land Treatment | | |

| 18. DISTRIBUTION STATEMENT | 19. SECURITY CLASS *(This Report)* | 21. NO. OF PAGES |
|---|---|---|
| Document available from performing office or NTIS, Springfield, Virginia 22151 | 20. SECURITY CLASS *(This page)* | 22. PRICE |

EPA Form 2220-1 (9-73)

GPO 814-040-8